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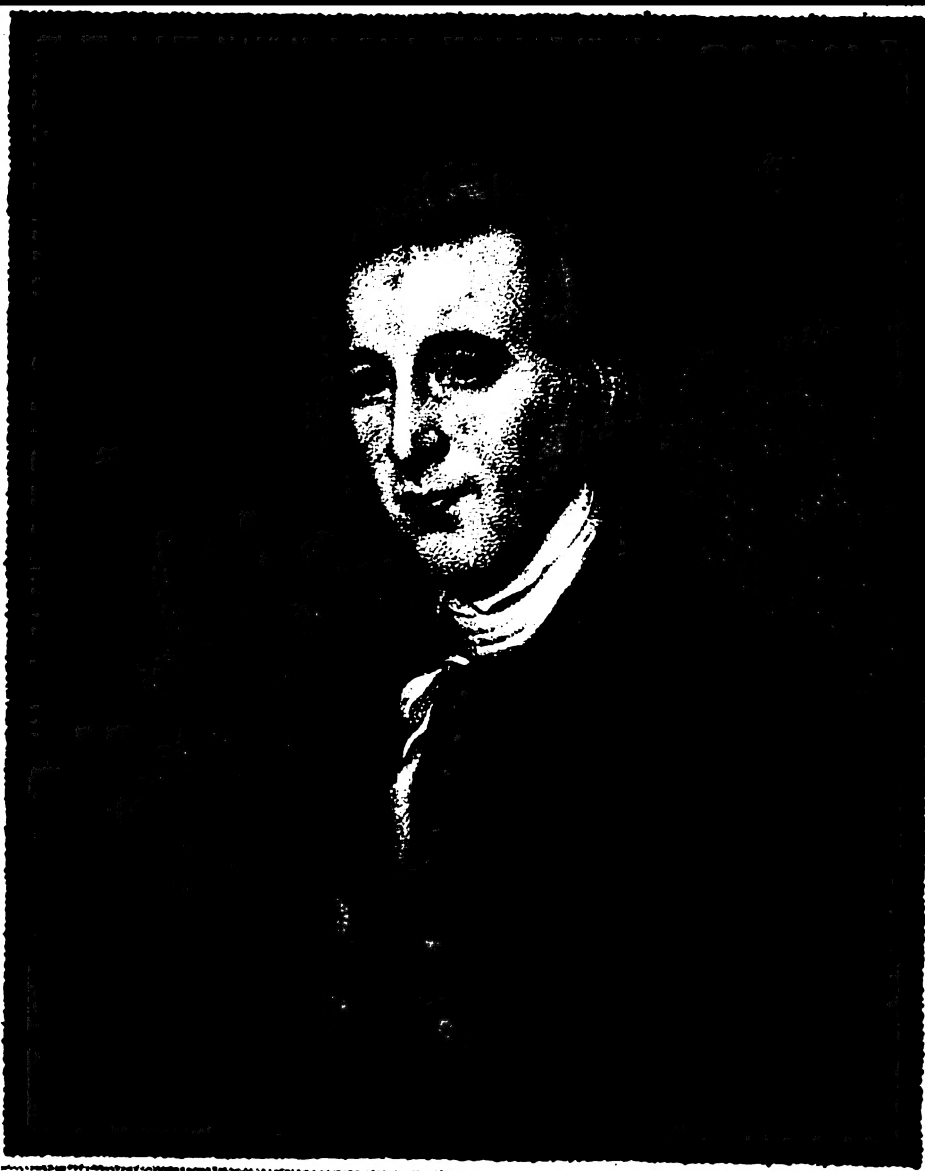
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*Memoirs of the life of David
Rittenhouse, LLD. F.R.S.*

William Barton

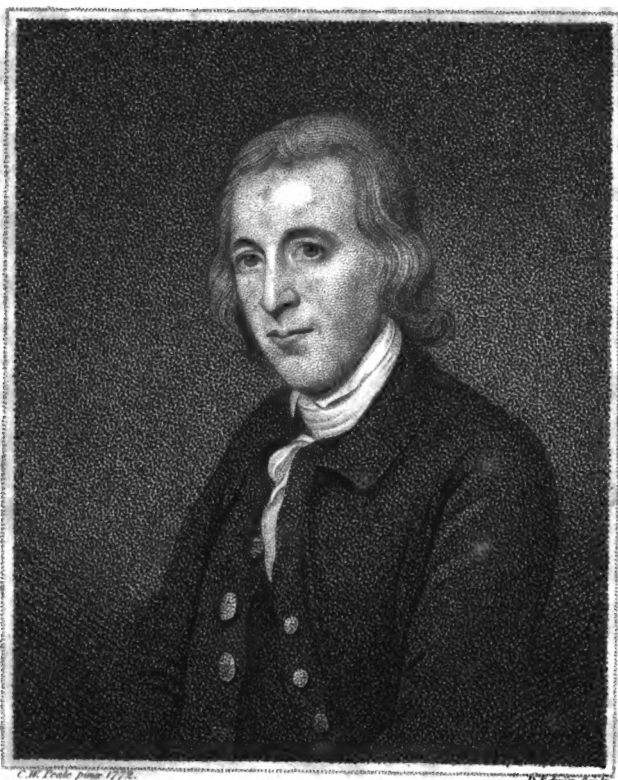
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C. B. Frolic pinx 1778.

J. A. Wilson del.

David Rittenhouse.

Ann. Aet. 40

From an original Picture in the possession of M^r Sergeant.

MEMOIRS

OF THE LIFE

OF

DAVID RITTENHOUSE, LL.D. F.R.S.

LATE PRESIDENT OF THE AMERICAN PHILOSOPHICAL SOCIETY, &c.

INTERSPERSED WITH

VARIOUS NOTICES OF MANY DISTINGUISHED MEN:

WITH

AN APPENDIX,

CONTAINING

SUNDRY PHILOSOPHICAL AND OTHER PAPERS,

MOST OF WHICH HAVE NOT HITHERTO BEEN PUBLISHED.

BY WILLIAM BARTON, M. A.

COUNSELLOR AT LAW;

Member of the American Philosophical Society, the Mass. Hist. Society, and the
Royal Economical Society of Valencia, in Spain.

PHILADELPHIA:

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1813.

DISTRICT OF PENNSYLVANIA, TO WIT:

BE IT REMEMBERED, That on the ninth day of October, in the thirty-eighth year of the independence of the United States of America, A. D. 1813, William Barton of the said district, hath deposited in this office the Title of a book, the right whereof he claims as Author, in the words following, to wit:

"Memoirs of the Life of David Rittenhouse, L L D. F. R. S. late President of the American Philosophical Society, &c. Interspersed with various notices of many distinguished men: with
"an Appendix, containing sundry philosophical and other papers, most of which have not
"hitherto been published. By William Barton, M. A. Counsellor at Law; Member of the
"American Philosophical Society, the Mass. Hist. Society, and the Royal Economical Society
"of Valencia, in Spain."

In conformity to the act of the Congress of the United States, intituled, "An act for the encouragement of learning, by securing the copies of maps, charts and books, to the authors and proprietors of such copies during the times therein mentioned."—And also to the act entitled, "An act supplementary to an act, entitled, "An act for the encouragement of learning, by securing the copies of maps, charts, and books, to the authors and proprietors of such copies during the times therein mentioned," and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL,
Clerk of the District of Pennsylvania.

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PREFACE.

AGREEDABLY to the plan on which the following memoirs have been conducted, it will be perceived, that they contain a great variety of matter ; of which, some particulars have a remote, others merely an incidental connexion, with the chief object of the work. There may perhaps be some readers, to whom the introduction of such matters as the *University of Pennsylvania* and the *Medical School* connected with it, the *Pennsylvania Hospital*, the *Philadelphia Library*, and the like, into the *Life of Rittenhouse*, will, on a cursory view, seem to have little or no affinity to that object. But when it is considered, that this work is designed to comprehend Memoirs, not only of Rittenhouse personally, but of several literary, scientific, and other public institutions, as well as of many eminent men, with which his individual history and the annals of his time were in various ways associated, it is presumed, that the slight sketches which have been taken of those matters, in passing along, will neither prove foreign to the nature of the present undertaking, nor uninteresting in themselves. As a citizen of Pennsylvania ; as an inestimable public and private character ; as a distinguished son of science, of great

probity and extensive usefulness in society ; in all these points of view, the History of Dr. Rittenhouse may be contemplated, as holding a relationship with almost every object connected with science and the arts, in his day, that could in any wise contribute to the well being of mankind in general, and his native country in particular. Conspicuous and eminently meritorious as he was, yet an insulated account of his talents, his virtues, and his personal services,—a bare specification of such qualities and merits as he possessed, abstracted from a due consideration of the state of society and circumstances resulting from it, taken in connexion with them, during the same period,—would not be equally intelligible and instructive ; and, consequently, must prove less useful. For these reasons, the Memorialist has pursued that course which he conceives to be perfectly congenial with the main design of his work ; as best calculated to promote its general usefulness, and most suitably adapted to render it interesting, even to those who read for amusement solely.

In the adoption of this plan, the writer has been chiefly influenced by a desire to illustrate the history, genius and character of the times, which his Memoirs embrace ; together with the progress and improvement of literature, science and the arts, within the same compass, more especially in this country ; and this consideration has obviously led him to introduce, in conjunction with those objects, as well as with the

Life of the great American Philosopher, various notions of many persons distinguished for their talents and merit, not only in our own time, but at different periods in the annals of science. He has thought it right to rescue from oblivion—to commemorate in this way, if not to consecrate, the names of some men in this country, more especially, who deserve to be ranked among the worthies of America. All this the writer has done, too, in conformity to the mode prosecuted by some of the most judicious biographers and memorialists, together with other writers of the same class: It is believed to be a manner of treating the interesting subjects, on which the pens of such authors have been employed, which, while it renders their works more pleasing, greatly increases their usefulness.—If, therefore, some of the matter which has been introduced into the present work should, at first sight, appear irrelative, and even unimportant, the Memorialist nevertheless flatters himself, that, on reflection, nothing will be deemed really so, how remotely soever it may seem, on a transient view of the subject, to be connected with the principal design of the undertaking; provided it has a tendency to illustrate the great objects he was desirous of accomplishing.*

* The biographer of RITTENHOUSE entirely coincides with the compilers of the *Encyclopædia Britannica*, in opinion, respecting the utility and propriety of giving an account, in such Memoirs as the present, of *things* as well as *persons*, connected in various ways with the main object of the work.

The diversity of the materials which are, by these means, blended with the biographical account of Dr. Rittenhouse, in the Memoirs now presented to the world, made it expedient, in the opinion of the writer, to have recourse to the free use of notes, for the purposes of illustration, reference, and explanation. In a work of such a complexion—constituting a book composed of very various materials, designed to elucidate and inform, as well as to please—it became, in

In the preface to that useful dictionary of arts, sciences and miscellaneous literature, are the following observations: the consideration they merit, is submitted to the good sense of the reader.

“While one part of our readers,” say the encyclopedists, when referring to the *biographical* department of their work, “will regret that we have given no account of their favourite philosopher, hero, or statesman, others may be disposed to remark, that we have dragged from obscurity the names of many persons who were no proper objects of such public regard. To these we can only reply, that, with the greatest biographer of modern times, we have long thought that there has rarely passed a life, of which a faithful narrative would not be useful; and that in the lives of the most obscure persons, of whom we have given any account, we saw something either connected with recent discoveries and public affairs, or which we thought capable of affording a lesson to great multitudes in similar circumstances.”—“Between eminent achievements and the scenes where they were performed, there is a natural and necessary connexion. The character of the warrior is connected with the fields of his battles; that of the legislator, with the countries which he civilized; and that of the traveller and navigator, with the regions which they explored. Even when we read of the *persons* by whom, and the occasions on which, any particular branch of knowledge has been improved, we naturally wish to know something of the *places* where such improvements were made.”

fact, necessary to throw a large portion of that matter into the form of notes ; in order to avoid, by numerous digressions on subjects arising out of the primary object of the work, too much disjointing of the text. There are persons, no doubt, by whom this course will be disapproved. The able and learned author of the *Pursuits of Literature* has been accused by *some* critics—while others, who have no pretensions to those qualifications which entitle a man to exercise the functions of a critic, have even affected to laugh at him—for the multiplicity, the variety, and the length of the notes, which he has appended to that poem. But its being a *satirical* poem, is the circumstance to which may be fairly attributed the censorious cavils which his work excited: his satire was felt; and it roused the spleen of those who were its objects, and their partizans. The present work, however, is far from being intended to *satirise* any one: its author has no such object in view: for, although he has, in some instances, expressed his disapprobation of certain principles, theories, and even measures, which he believes to be not only repugnant to true science, but destructive of both private and social happiness—he has refrained as far as possible from personal censure;—he would much rather be engaged in the functions of an enlogist, than those of a censor. The numerous notes the Memorialist has employed—many of them, too, pretty long—will not therefore, he presumes, be objected to, on the ground of personality or supposed ill-humour. He has introduced them into

his *Memoirs*, because he believed them to be not only useful, but peculiarly well adapted to a work of this nature, and suited to answer the general scope of its design. The author may then say, in the words of the poetical writer just mentioned—as an apology for the frequency and copiousness of the notes annexed to these *Memoirs*;—"I have made no allusions which I did not mean to explain. But I had something further in my intention. The notes are not always explanatory; they are of a structure rather peculiar to themselves: many of them are of a nature between an essay and an explanatory comment. There is much in a little compass, suited to the exigency of the times. I expatiated on the casual subject which presented itself; and when ancient or modern writers expressed the thoughts better than I could myself, I have given the original languages. No man has a greater contempt for the parade of quotation (as such) than I have. My design is not to quote words, but to enforce right sentiments in the manner which I think best adapted to the purpose, after much reflection."

The method of disposing of the notes, in this work, may be thought by some to impair the symmetry of the page: but so trivial a defect as this may be, in the typographical appearance of the book, will, it is supposed, be amply compensated by the convenience the reader will experience, in having the annotations, almost always, on the same pages with their respective references.

In the arrangement of the Memoirs, the author has placed the incidents and circumstances relating to the Life of Dr. Rittenhouse, in their chronological order, as nearly as could be conveniently done.

AN APPENDIX,—containing sundry letters and other papers, which could neither be incorporated with propriety into the text, nor inserted in marginal notes,—is placed after the conclusion of the Memoirs. In this part of the work the reader will find, among other interesting documents, Dr. Rittenhouse's *Oration* on the subject of Astronomy, pronounced before the American Philosophical Society, in the year 1775. The addition of this treatise to the Life of our Philosopher, was rendered the more proper,—independently of the intrinsic merit of the performance,—by reason of the pamphlet having had, originally, a very limited circulation, and its being now out of print. The Notes, added to this little tract, as well as to some other papers in the Appendix, by the Memorialist, are designated by the initials of his name; in order to distinguish the annotations from either the notes originally attached to them,—or from other matter, in the Text, not written by himself.

The author has embellished his work with an elegantly engraved likeness of Dr. Rittenhouse, executed by an able artist, from a portrait painted by Mr.

C. W. Peale, in the year 1772,* when our Philosopher was forty years of age. At that time he wore a wig,—and was so represented in the picture: but afterwards, when he resumed the wearing of his own hair, (and which he continued to do during the remainder of his life,) the portrait was altered accordingly, by Mr. Peale. The original picture (now in the possession of Mrs. Sergeant,) bore a strong resemblance to Dr. Rittenhouse, at that period of his life in which it was taken; and the engraving, prefixed to these Memoirs, is an excellent copy.

To a portion of the readers of this work, some of the matter it contains may be thought superfluous,—because already familiar to *them*: and, to men of extensive learning and research, *much* of the information herein collected may really be so. But to persons of less erudition and science, the knowledge thus com-

* Mr. C. W. Peale painted at the same time another portrait of him, for himself; which is likewise altered from the original painting. It has a place in Mr. Peale's Gallery of Portraits. There is a third, by the same hand, in the possession of the American Philosophical Society.

Another good picture of Dr. Rittenhouse was also then made, by Mr. James Peale, for the Rev. Mr. Barton. This (which represents him with a wig) is now in the possession of John Moore White, Esq. of New-Jersey, who married Mr. Barton's youngest daughter.

A pretty good mezzotinto, in a large size,—done from Mr. C. W. Peale's painting of our Philosopher,—was executed by Mr. E. Savage, in the winter of 1796: and since that time, some small engravings have been made from different pictures of him; but these do not so well preserve the likeness.

communicated, it may be presumed, will prove in some degree useful ; and the writer indulges a confident belief, that the greater number of his readers will derive both instruction and gratification, from a perusal of the Memoirs now offered to their attention.

The favours which the Memorialist has received, in the communication of sundry papers and some information for this work, demand his thankful acknowledgments to the contributors. Among these,—besides those gentlemen occasionally mentioned in the Memoirs,—the writer returns his thanks to his worthy relatives, Mrs. Sergeant, Mrs. Waters, and Dr. Benjamin Smith Barton ; and also to the Rt. Rev. Bishop White, Andrew Ellicott, Esq. John Vaughan, Esq. the Rev. Dr. Samuel Stanhope Smith, Charles Smith, Esq. and the Rev. Mr. Cathcart. To the friendship and politeness of these very respectable characters, he holds himself indebted, on this occasion.*

It has been the earnest desire of the writer, to adhere strictly to Truth, in every part of his narrative : he has not, therefore, introduced into his work any thing, as a matter of Fact, which he did not believe to

* Some interesting information was likewise communicated by the late Professor Rush. The death of that gentleman having occurred since the completion of the present work, the author has inserted a concise biographical notice of him, in the Appendix, in place of the mention originally made of his name in this preface.

be well founded. Wherever he has ventured to express an Opinion of his own, on any subject of importance, it must be left to the judgment and candour of others to determine, what weight it may be entitled to.—In the various quotations which appear in his Memoirs, the writer has endeavoured to observe the utmost fidelity, with respect to the originals; and all his translations into the English, from other languages, have been made with a like scrupulous attention to correctness.—Some errors and inaccuracies have nevertheless, it may be readily supposed, found their way into the following work; though the writer trusts they are neither numerous nor very important: and, as they are wholly unintentional, of whatever description they may be, he hopes it will not be deemed presumptuous in him, to claim for them the indulgence of a candid, liberal, and discerning public.

LANCASTER, in Pennsylvania,
April 11, 1813.

INTRODUCTION.

THE individuals in society, who present to the view of their cotemporaries, and transmit to posterity, Memorials of illustrious men,—more especially those of their own country,—discharge thereby a debt of gratitude : because every man is, directly or indirectly, *interested in the benefits conferred on his species, by those who enlarge the sphere of human knowledge, or otherwise promote the happiness of mankind.*

But the biographer of an highly meritorious character aims at more than the mere performance of that duty, which a grateful sense of obligation exacts from him, in common with every member of the community, in commemorating the beneficence of the wise and the good : he endeavours to excite in great and liberal minds, by the example of such, an ambition to emulate their talents and their virtues ;—and it is these, that, by their union, constitute true greatness of character.

The meed of applause which may be sometimes, and too often is, bestowed on meretricious worth, is ever unsteady and fleeting. The pseudo-patriot may happen to enjoy a transient popularity ; false philoso-

phy may, for a while, delude, if not corrupt, the minds of an unthinking multitude; and specious theories in every department of science,—unsupported by experience and untenable on principles of sound reason,—may give to their projectors a short-lived reputation: But the celebrity which is coveted by the man of a noble and generous spirit,—that estimable species of fame, which alone can survive such ephemera of error as are often engendered by the vanity of the individual and nurtured by the follies or vices of the many,—must ever rest on the permanent foundation of truth, knowledge and beneficence.

Virtue is essentially necessary to the constitution of a truly great character. For, although brilliant talents are sometimes found combined with vicious propensities,⁽¹⁾—the impulse given to men of this description, often renders their great abilities baneful to society: they can seldom, if ever, be productive of real public good. Should eminent talents, possessed by a man destitute of virtue, even take a right direction in their operation, by reason of some extraordinary circum-

(1) Hence, in conformity to this sentiment, Mr. Pope says, when animadverting on the insufficiency of talents, alone, for acquiring an honourable fame and meriting a character truly great,—

“ If parts allure thee, think how Bacon shin’d,
The wisest, brightest, meanest of mankind;
Or, ravish’d with the whistling of a name,
See Cromwell damn’d to everlasting fame.”

[ESSAY ON MAN.]

stance,—such an event ought never to be calculated on : It is not the part of common sense,—much less of a cautious prudence, acquired by a knowledge of mankind,—to expect praise-worthy conduct from any one, whose predominating passions are bad, however great may be his capability of doing good.

While, therefore, the mind may view, with a sort of admiration, the achievements of a magnanimous soldier, it turns with indignation from the atrocities of a military tyrant : and at the same time that it may be induced to contemplate even with complacency, at the first view, the plausible, yet groundless speculations of ingenious theorists, in matters of science,—still the fallacy of their systems, when developed by experience, strips them of all their tinsel glare of merit. Thus, too, the applause which the world justly attaches to the character of a patriot-hero, deserts the unprincipled ruffian-warrior, however valiant and successful he may prove : In like manner, reason and experience expose to the censure of the good and the derision of the wise, the deleterious doctrines of metaphysical statesmen and philosophers.⁽²⁾ Such esti-

(2) The miserable consequences which have resulted to the civilized world, from the mode of reasoning *abstractly*, and from the mere *synthetical* plan of philosophising, are too apparent to need much comment. Even some *geometricians* of great name have been seduced, by such means, into monstrous absurdities in physics ; and into the maintenance of doctrines, alike subversive of religion and morals, as destructive of the foundations of civil society. Such were Descartes, Leibnitz and Spinoza, of the se-

nable qualities as they may possess, in either character, are merged in the mischievous or base ones, with

venteenth century : and such have been, and even now are, too many of that class of modern philosophers, as well in this country as on the continent of Europe,—whose metaphysical notions of religion and government, (although some of them may, perhaps, be pretty correct on the subject of physics, alone,) have been the means of inundating the world with scepticism ; and, after overturning regular, orderly, and peaceable states, of establishing despotism and misery on the ruins of rational government, in many of the fairest portions of the old world.

Even Voltaire, who had, himself, been instrumental in corrupting the mind of the great Frederick of Prussia, and, thus, of furnishing the means for the subsequent overthrow of that once powerful monarchy ; even *this infidel* could not help exclaiming, in a moment of sober reflection, “ Who could have believed, that *geometricians* have been wild enough to imagine, that, in the exaltation of the soul, we may possess the gift of divination ; yet more than one philosopher took it into their heads, by the example of *Descartes*, to put themselves into God’s place, and create a world with a word ! But now, all *these philosophical follies* are reproved by the wise ; and even their fantastical edifices, overthrown by reason, have left in their ruins, materials, of which reason has made some use.—A like extravagance has infected the *moral world* : there have been some understandings so blind as to undermine the very foundation of society, at the time they thought to reform it. They have been mad enough to maintain that the distinctions of *meum & tuum* are criminal, and that one ought not to enjoy the fruits of one’s own labour ; that not only all mankind are upon a level, but that they have perverted the order of nature, in forming societies ; that men are born to be separated from each other, like wild beasts ; and that amphibious animals, with bees and ants, confound the eternal laws, by living in common ! These impertinences, worthy of an hospital of madmen,” continues Mr. de Voltaire, sarcastically, “ have been for some time in fashion, just as it is customary to lead apes to dance, at fairs.” [See THE AGE OF LOUIS XV. ch. 39.]

which they are combined : thus, infamy or contempt eventually become the merited portion of crime or of folly, as either one or the other may prevail. A Cæsar,⁽³⁾ a Cromwell and a Robespierre, with other

But although it cannot be doubted, that the society of Voltaire contributed to support, if not to generate, the deistical principles of Frederick II. other foreigners, whom he had patronized and cherished in his own capital, and with whom he associated, most of them Frenchmen, did much towards debanching his mind, in regard to religion. The Prince de Ligne, a distinguished Austrian field-marshal, has verified this remark. In a letter written to the king of Poland, in the year 1785, the prince ~~narrates~~ some particulars of a conversation which took place between the Prussian monarch and himself, in the year 1770 ; and observes, that the king expressed his libertine sentiments too freely, even making a boast of his irreligion. The prince de Ligne, on this occasion, charges freethinkers with a want of candour, in promulgating opinions fraught with infidelity, while many of them heartily dread the consequences of what they affect to renounce. But this, he remarks, is not their only fault : “ they are also apt,” says he, “ to make a parade of free-thinking ; which betrays, at least, a want of taste. It was,” continues the prince, “ from having been surrounded by men of bad taste, such as D’Argens, Maupertuis, La Beaumelle, La Mettrie, the Abbé de Brades, and some clumsy infidels of his academy, that the king had contracted the habit of abusing religion, and talking of dogmas, Spinozism, the court of Rome, &c.”

LETTERS AND REFLEXIONS OF THE PRINCE DE LIGNE.

(3) However Cæsar may be admired as an accomplished gentleman and scholar,—or even as a great and gallant soldier,—he ought ever to be reprobated as an usurper and a tyrant.—Dr. Adam Ferguson remarks, that “ Julius Cæsar possessed the talent of influencing, of gaining, and employing men to his purpose, beyond any other person that is known in the history of the world : but it is surely not for the good of mankind,” continues this able writer, “ that he should be admired in other respects.

scourges of mankind, of like character, will therefore be viewed as objects of execration by posterity, while the memories of an Alfred, a Nassau, and a Washington—a Chatham, a Burke, and an Ames,—will be venerated, to the latest posterity.

Much of the glory of a nation results from the renown of illustrious men, among its citizens: a country which has produced many great men, may justly pride itself on the fame which those individuals had acquired. The community to which we belong is entitled to such services as we can render to it: these the patriot will cheerfully bestow; and, in promoting the honour and prosperity of his country, a large portion of the lustre which the exertion of his talents shall have shed upon it, are again reflected on himself.⁽⁴⁾

To admire even his clemency, is to mistake for it policy and cunning." [See Ferguson's *Hist. of the Progress and Termination of the Roman Republic*, vol. 5. ch. 36.]

Indeed our admiration of the great *military* talents of such a man as Cæsar, may carry us too far. Mr. Hume, in his *History of England* (ch. 47.) very justly observes—that "The unhappy prepossession which men commonly entertain in favour of ambition, courage, enterprise, and other warlike virtues, engages generous natures,—who always love fame,—into such pursuits as destroy their own peace, and that of the rest of mankind."

(4) Mr. Fontenelle in his *Eloge* on Sir Isaac Newton (published by the Royal Academy of Sciences, at Paris,) mentions particularly the great honours that were paid him, by his countrymen, as well during his life as after his decease. "The English," says he, "are not apt to pay the less regard to great abili-

The cultivator of those branches of natural science which constitute practical and experimental philoso-

ties, for being of their native growth ; but instead of endeavouring to lessen them by injurious reflexions, or approving the envy which attacks them, they all join together in striving to advocate them,"—" They are sensible that a great genius must reflect honour upon the state ; and whoever is able to procure it to their country, is upon that account infinitely dear to them."—" Tacitus," says he, " who has reproached the Romans with their extreme indifference towards the great men of their own nation, would have given the English quite a different character."— And, after describing the almost princely magnificence, in the manner of Newton's interment in Westminster Abbey, Mr. Fontenelle remarks, that we must almost go back to the ancient Greeks, if we would find a like instance of so great a veneration paid to learning.

The following epitaph, in classical Latin, is inscribed on the noble monument erected to the memory of Newton, in the Abbey Church of Westminster :

H. S. E.

Isaacus Newton, Eques Auratus,
 Qui vi animi prope divinâ
 Planetarum motus, figuras,
 Cometarum semitas, Oceanique æstus,
 Sua mathesi facem præferente,
 Primus demonstravit.
 Radiorum lucis dissimilitudines,
 Colorumque inde nascentium proprietates
 Quas nemo antea vel suspicatus erat, prevestigavit,
 Naturæ, Antiquitatis, S. Scripturæ,
 Sedulus, sagax, fidus interpres,
 Dei Opt. Max. majestatem philosophiâ asseruit,
 Evangelii simplicitatem moribus expressit,
 Sibi gratulentur mortales, tale tantumque exstitisse,
 Humani Generis Decus.
 Natus XXV. Decemb. MDCXLII. Obiit XX. Mart.
 MDCCXXVI.

phy,—equally with the teacher of religion and morals,—extends the beneficial effects of his researches and knowledge beyond the bounds of his particular country. Truth is every where the same; and the promulgation of it tends, at all times and in all places, to elevate to its proper station the dignity of man. The more extensively, then, true sciences can be diffused, the greater will be the means—the fairer will be the rational prospect, of enlarging the sphere of human happiness. The philosopher may, pre-eminently, be considered as a citizen of the world; yet without detracting in any degree from that spirit of patriotism, which ever stimulates a good man to contribute his primary and most important services to his own country. There are, indeed, some species of aids, which are exclusively due to a community, by all its citizens; and, consequently, such as they are bound to withhold from other national communities, in certain contingencies and under peculiar circumstances. But a knowledge of those truths which lead to the acquisition of wisdom and practice of virtue, serves to meliorate the condition of mankind generally, at all times, and under all circumstances;—inasmuch as they greatly assist in banishing error, with its frequent concomitant, vice, not only from the more civilized portions of the world, but also by their inherent influence, from among nations less cultivated and refined.

The truths promulgated by means of a natural and sublime philosophy—corresponding, as this does, with

the dignity of an enlightened spirit—must ever emanate from a virtuous heart as well as an expanded intellect. Hence, the real philosopher,—he whose principles are unpolluted by the sophisticated tenets of some modern pretenders to the appellation,—can scarcely fail to be a *good man*. Such was the immortal Newton; such were a Boyle, a Hale and a Barrow,—a Boerhaave, a Stephen Hales and a Bradley; with many worthies equally illustrious,—whose glories will, for ever, retain their primitive splendour.

Even the most celebrated sages of antiquity, extremely imperfect as we know the philosophy of the early ages to have been, elucidated, by the purity of their lives and the morality of their doctrines, the truth of the position,—that the cultivation of natural wisdom, unaided as it then was by the lights of revelation, encreased every propensity to moral virtue. Such were Socrates, Plato his disciple, and Anaxagoras; who flourished between four and five centuries before the Christian era.

The life of Socrates, who is styled by Cicero *the Father of Philosophers*, afforded a laudable example of moderation, patience, and other virtues; and his doctrines abound with wisdom. Anaxagoras and Plato united with some of the nobler branches of natural science, very rational conceptions of moral truth. Both of them had much higher claims to the title of philosophers, than Aristotle, who appeared about a

century afterwards. This philosopher, however,—for, as such, he continued for many ages to be distinguished in the schools,—was, like Socrates, more a metaphysician than an observer of the natural world. His morality is the most estimable part of his works; though his conceptions of moral truths were much less just than those of Anaxagoras and Plato:⁽⁶⁾ for his

(5) Aristotle is supposed, by some, to have imbibed the best and most rational of his notions from his master Plato; to whom, notwithstanding, he seems to have been greatly inferior as a moral philosopher.

His opinions respecting government, abound in good sense. As a general outline of his sentiments on this subject, it may serve to mention, that he distinguished civil government into two kinds; one, in which the general welfare is the great object; the other, in which this is not at all considered.* In the first class, he places the limited monarchy—the aristocratical form of government—and the republic, properly so called. In the second, he comprehends tyranny—oligarchy—and democracy; considering these as corruptions of the three first. Limited monarchy, he alleges, degenerates into despotism, when the sovereign assumes to himself the exercise of the entire authority of the state, refusing to submit his power to any controul;† the aristocracy sinks into an oligarchy, when the supreme power is no longer possessed by a reasonable proportion of virtuous men,—but by a small number of rulers, whose wealth alone constitutes their claim to authority; and the republican government is debased into a democracy, when the poorest class of the people have too great an influence in the public deliberations.‡

In Physics, Aristotle scarcely deserves the name of a Philosopher.—As to his metaphysical opinions, in the common acceptance of the term,—it is impossible to ascertain, with certainty, what they really were. It was not until eighteen centuries after

* Aristot. de Rep.—lib. 3. cap. 6.

† Id. Rhet.—lib. 1. cap. 8.

‡ Id. de Rep.—lib. 3. cap. 7.

physics are replete with notions and terms alike vague, unmeaning and obscure.⁽⁶⁾ The intimate con-

his death, that his philosophy—such as it was then promulgated, anew—began to be generally known and studied. After the sack-
ing of Constantinople by the Turks, in the year 1453, some fugi-
tive Greeks, who had escaped the fury of the Ottoman arms,
brought from that city into the west of Europe many of the writ-
ings of the Stagyrish philosopher: But, although some of his
treatises were previously known, they were such as had passed
through the hands of the Arabs, in translations into their tongue;
done by men who, it may be fairly presumed, very imperfectly
understood the author's language; consequently not capable,
even if they were disposed, to do justice to the sense of the ori-
ginal. Subsequent translations of those writings, from the Ara-
bic, probably occasioned, in the same way, further departures
from the meaning of the original Greek. Thus varying, as may
be supposed, from the opinions taught by Aristotle himself,—
the philosophy of the schoolmen, engrafted upon his systems,
was neither entirely that of the Stagyrite, nor altogether different.
His writings, nevertheless, gave birth to what is termed the
Scholastic Philosophy,—“that motley offspring of error and in-
genuity,” as it is called by Mr. Mallet.* “To trace at length,”
says this writer, “the rise, progress, and variations of *this philo-
sophy*, would be an undertaking not only curious, but instruc-
tive; as it would unfold to us all the mazes in which the force,
the subtlety, the extravagance of human wit, can lose themselves:
till not only profane learning, but Divinity itself, was at last, by
the refined frenzy of those who taught both, subtilized into mere
notion and air.”†

(6) Baron Bielfeld (in his *Elements of Universal Erudition*)
observes, that the fondness for Aristotle's reveries began about
the twelfth century. It was then, that the *scholastic* philosophy

* In his *Life of Lord Chancellor Bacon*.

† Ibid.

nexion that subsists between the physical and moral fitness of things, in relation to their respective objects, was more evidently known to Anaxagoras and Plato, than to either Socrates or Aristotle : and the reason is obvious ;—both of the former cultivated the sublime science of *Astronomy*.

was formed. This was partly borrowed from the writings of the Arabs, who were always attached to the theories of Aristotle : they were initiated into a subtle, ambiguous, abstract and capricious mode of reasoning ; by which they never hit the truth, but constantly went on the one side, or beyond the truth. Toward the end of the fourteenth century, continues the learned Baron, this absurd system arrived to a great height. It became a mere jargon, a confused heap of unintelligible ideas.

The celebrated Mr. Boyle, the great successor of Lord Verulam (St. Albans) in experimental philosophy, is said to have declared against the Philosophy of Aristotle, as having in it more of words than things ; promising much and performing little ; and giving the Inventions of Men for indubitable proofs, instead of building upon observation and experiment. He was so zealous for, and so scrupulous about, this true method of learning by experiment, that, though the *Cartesian* philosophy then made a great noise in the world, yet he would never be persuaded to read the works of *Descartes* ; for fear he should be amused, and led away, by plausible accounts of things founded on conjecture, and merely hypothetical. (See Art. *Boyle*, in the New and General Biography.)—This great and excellent man was born the same year in which Bacon, Viscount St. Albans, died.

Epicurus, the disciple of Democritus, and follower of the Philosophy of Aristotle, was engaged, although unsuccessfully enough, in the labyrinth of Metaphysics, as well as in Physics. He adopted the system of *Atoms*, which Democritus first propagated ; and hence appears to be derived Descartes's equally preposterous doctrine of the *Plenum* and of *Vortices*.

To this cause, then, may be fairly attributed the half-enlightened notions of the Deity,⁽⁷⁾ and of a future state, entertained by these pagan searchers after truth. To the same cause may be traced the sentiment that dictated the reply made by Anaxagoras,—when, in consequence of his incessant contemplation of the stars, he was asked, “*if he had no concern for his country?*”—“*I incessantly regard my country,*” said he, pointing to Heaven.

Plato’s attention to the same celestial science unquestionably enlarged his notions of the Deity, and enabled him to think the more justly of the moral attributes of human nature. According to Plato—whose morality, on the whole, corresponds with the system maintained by Socrates,⁽⁸⁾—the human soul is a ray from the Divinity. He believed, that this minute portion of infinite Wisdom, Goodness and Power, was omniscient, while united with the Parent stock from which it emanated; but, when combined with the body, that it contracted ignorance and impurity from that union. He did not, like his master Socrates,

(7) “Nulla gens tam fera, quæ non sciat Deum habendum esse, quamvis ignoret qualem habere debeat.”

CIC. de Naturâ Deorum.

(8) While Plato followed the morals of Socrates, he cultivated the metaphysical opinions of Pythagoras. He is said to have founded his physics on the notions of Heraclitus: it may be presumed, nevertheless, that he derived that branch of his system from a better source.

neglect natural philosophy; but investigated many principles which relate to that branch of knowledge:—and, according to this philosopher, all things consisted of two principles,—*God* and *matter*.

It is evident that Plato believed in the immortality of the soul of man; but he had, at the same time, very inadequate conceptions of the mode or state of its existence, when separated from the body. It seems to have been reserved for the Christian dispensation, to elucidate this great *arcanum*, hidden from the most sagacious of the heathen philosophers.⁽⁹⁾ It was the difficulty that arose on this subject, the incapability of knowing how to dispose of the soul, or intellectual principle in the constitution of our species, after its disentanglement from the body; a difficulty by which all the philosophers, antecedent to the promulgation of Christianity, were subjected to unsurmountable perplexities;—it was this, that rendered even the expansive genius of Anaxagoras utterly incompetent to conceive of the possibility that the soul should exist, in-

(9) “ *Reason*, tho’ taught by sense to range on high,
To trace the stars and measure all the sky;
Tho’ fancy, memory, foresight fill her train,
And o’er the beast he lifts the pride of man;
Yet, still to *matter*, *form* and *space* confin’d,
Or moral truths or laws that rule mankind,
Could ne’er, *unaided*, pierce the mental gloom,
Explore *new* scenes *beyond the closing tomb*,
Reach with *immortal* hope the blest abode,
Or raise one thought of *spirit* or of *God*.”

Vision of Columbus, book VIII.

dependent of some union with matter. He therefore invented the doctrine of the *Metempsychosis*; in order to provide some receptacle of organised matter for that imperishable intellectual principle attached to our nature here, after its departure from the human frame; and to which new vehicle of the vital spirit of its original but abandoned abode, the extinguished corporeal man, its union with it should impart the powers and faculties of animal life.

Cultivating, as Plato did, the mind-expanding science of Astronomy, faintly even as the true principles of this branch of science were then perceived,⁽¹⁰⁾ this philosopher could not fail to derive, from the vastness, beauty and order, manifested in the appearances and revolutions of the heavenly bodies, a conviction of the perpetual existence of a great intelligent First Cause. It was, indeed, as the Abbé Barthelemy justly remarks, the order and beauty apparent through the whole universe, that compelled men to resort to a First Cause:⁽¹¹⁾ This, he observes, the early philosophers of

(10) "An inordinate desire to explain and generalise, without facts and observations, led the ancient philosophers to the most absurd and extravagant notions; though, in a few cases, they have displayed the most wonderful ingenuity, and sagaciously anticipated the discoveries of modern times."

New Edinb. Encyclopf. tit. Astronomy.

(11) "If the petty motions of us mortals afford arguments for the being of a God, much more may those greater motions we see in the world, and the phænomena attending them: I mean, the motions of the planets and heavenly bodies. For these must

the Ionian school (which owed its origin to Thales) had acknowledged. But Anaxagoras⁽¹²⁾ was the first who discriminated that First Cause from matter; and not only this distinguished pupil of Thales,⁽¹³⁾ but Anaximander, who, antecedently to him, taught philosophy at Athens, with Archelaus the master of Socrates, all treated in their writings of the formation of the universe, of the nature of things, and of geometry and astronomy.

According to Mr. Gibbon, the philosophers of Greece deduced their morals from the nature of man,

be put into motion either by one common mighty Mover, acting upon them immediately, or by causes and laws of His appointment; or by their respective movers, who, for reasons to which you can by this time be no stranger," (referring his reader to preceding arguments), "must depend upon some Superior, that furnished them with the power of doing this. And granting it to be done either of these ways, we can be at no great distance from a demonstration of the existence of a Deity."—Wollaston's *Rel. of Nat. delineated*, sect. v. head 14th.

(12) A disciple of Anaximenes, and preceptor to Socrates. He died 428 years B. C. in the seventy-second year of his age.

(13) Thales, of Miletus in Ionia, was one of the seven sages of Greece: he was born about six hundred and forty years before the Christian era. After travelling into other countries, he returned to his own, and there devoted himself exclusively to the study of nature. Being the first of the Greeks who made any discoveries in *Astronomy*, he is said to have astonished his countrymen, by predicting a solar eclipse; and he instructed them, by communicating the knowledge of geometry and astronomy, which he had acquired while in Egypt. He died in the ninety-sixth year of his age,—544 years B. C.

rather than from that of God. They meditated, however, as we are informed by this very ingenious historian, on the Divine Nature, as a most curious and important speculation; and, in the profound enquiry, they displayed both the strength and the weakness of the human understanding. The Stoics and the Platonists endeavoured to reconcile the interests of reason with their notions of piety. The opinions of the Academicians and Epicureans, the two other of the four most celebrated schools, were of a less religious cast: But, continues Mr. Gibbon, whilst the modest science of the former induced them to doubt, the positive ignorance of the latter urged them to deny, the providence of a Supreme Ruler.

Cicero⁽¹⁴⁾ denominated the God of Plato the *Maker*, and the God of Aristotle the *Governor*, of the world.⁽¹⁵⁾

(14) Marcus Tullius Cicero—the same that has been already mentioned. He was, himself, not only one of the most learned and eloquent men, but one of the greatest philosophers, of antiquity. This illustrious Roman (whose death occurred forty-three years before the Christian era) firmly believed in the being of a God. He was likewise a decided advocate for the doctrine of the soul's immortality; concerning which, some fine reasoning will be found in his book on *Old Age*;—a doctrine, however, by no means confined to Cicero alone, but one maintained by many of the most eminent among the heathen philosophers, in the early ages. Plato appears to have been the first who supported that opinion upon sound and permanent arguments, deduced from truth and established principles.

(15) Cicero himself says, "If any one doubt, whether there be a God, I cannot comprehend why the same person may not as

It is somewhere observed, that it is no reflection on the character of Plato, to have been unable, by the efforts of his own reason, to acquire any notion of a proper creation ; since we, who have the advantage of his writings, nay of writings infinitely more valuable than his, to instruct us, find it extremely difficult, if not impossible, to conceive how any thing can first begin to have an existence. We believe the fact, on the authority of Revelation.

well doubt, whether there be a sun or not." [*De Naturâ Deorum*, 2. 2.]

It is observed by Dr. Turnbull, in his annotations on Heineccius's *System of Universal Law*, that Polybius as well as Cicero, and indeed almost all the ancient philosophers, have acknowledged, that a public sense of Religion is necessary to the well-being and support of civil society : and such a sentiment of Religion is inseparable from a reasonable conception of the being and attributes of the Deity. "Society," says Dr Turnbull very truly, "can hardly subsist without it : or, at least, it is the most powerful mean for restraining from vice ; and for promoting and upholding those virtues by which society subsists, and without which every thing that is great and comely in society must soon perish and go to ruin."—"With regard to private persons," continues this learned writer, "he who does not often employ his mind in reviewing the perfections of the Deity, and in consoling and strengthening his mind by the comfortable and mind-exalting reflexions, to which meditation upon the universal providence of an all-perfect mind, naturally, and as it were, necessarily lead, deprives himself of the greatest joy, the noblest exercise and entertainment, the human mind is capable of ; and whatever obligations there may to virtue, he cannot be so firm, steady, and unshaken in his adherence to it, as he, who, being persuaded of the truth just mentioned, is daily drawing virtuous strength and comfort from it." [See the Annotator's remark on ch. v. b. i. of *Heineccius*.]

Great were, undoubtedly, the improvements in astronomy, made by the Greek philosophers of early ages, on such of its rudiments as were handed down to them from these nations by whom it was first cultivated: ⁽¹⁶⁾ Yet it can scarcely be conceived, that, until the celebrated Euclid of Alexandria, ⁽¹⁷⁾ and his follow-

(16) The Greeks derived their knowledge of astronomy from the Egyptians and Chaldeans. According to Plutarch, the sciences began to unfold themselves about the time of Hesiod, the Greek poet, who flourished upwards of nine centuries before the Christian era; but their progress was very slow, until the time of Thales, which was about three centuries later. And although this celebrated philosopher of antiquity rendered himself famous by foretelling an eclipse of the sun, he only predicted the *year* in which it was to happen. Even this, it is remarked by Mr. Vince (in his invaluable work, entitled, *A Complete System of Astronomy*,) he was probably enabled to do by the *Chaldean Saros*, a period of 223 lunations; after which, the eclipses return again nearly in the same order. Philolaus, a disciple of Pythagoras, lived about four hundred and fifty years before Christ, and is said to have taught the true solar system,—placing the sun in the centre, with the earth and all the planets revolving about it; a system which, it is believed, Pythagoras himself had conceived, and was inclined to adopt.

However, Hipparchus, who lived between one hundred and twenty-five and one hundred and sixty years before the Christian era, and whom Mr. Vince styles “the Father of Astronomy,” was the first person that cultivated every part of that science. His discoveries, together with those of Ptolemy, are preserved in the *Μεγάλη Σύνταξις*, or *Great Construction*,—Ptolemy’s celebrated work on Astronomy, named by the Arabs the *Almagest*, and now usually so called.

(17) This great philosopher of antiquity, so justly entitled to celebrity for his mathematical works, flourished three hundred years before the Christian era. Care should be taken not to confound him with Euclid of Megara, who lived a century earlier. The

ers, had reduced the mathematics of Thales and others of those philosophers, into regular systems of arithmetical and geometrical science, the true principles of astronomy could be ascertained. In fact, seventeen centuries and an half had elapsed, from the time of that great geometrician, before Copernicus appeared: when this wonderful genius, availing himself of such remnants of the ancient philosophy, as the intervening irruptions of the barbarous nations of the north upon the then civilized world had left to their posterity, opened to the view of mankind the real system of the universe.⁽¹⁸⁾—So vast was the chasm, during which the nobler branches of physics remained uncultivated and neglected, that, from the age of

latter, as the Abbé Barthelemi observes, being too much familiarized with the writings of Parmenides and the Elean school, had recourse to abstractions; “a method,” says the Abbé, “often dangerous, oftener unintelligible.” Just after, he adds: “The subtleties of metaphysics calling to their aid the quirks of logic, words presently took place of things, and students acquired nothing in the schools but a spirit of acrimony and contradiction.” *Travels of the younger Anacharsis*, vol. iii. chap. 37.

(18) That the sun is at rest, and that the planets revolve round him, is an opinion that appears to have been received of old, by Philolaus, Aristarchus of Samos, and the whole sect of the Pythagoreans. It is probable, as Mr. Rowning* observes, that this notion was derived from them, by the Greeks: But the opinion that the sun stood still in the centre, while the whole heavens moved around it, was the prevailing one, until Copernicus, by the establishment of his system, restored the ancient astronomy of the Pythagorean school.

* In his *Compendious System of Natural Philosophy*.

Euclid, fourteen centuries passed away, before Roger Bacon, an English Franciscan friar, began his successful enquiries into experimental philosophy.—This extraordinary man is said to have been almost the only astronomer of his age; and he himself tells us, that there were not, then, more than three or four persons in the world who had made any considerable proficiency in the *mathematics*!

But after the appearance of Copernicus,⁽¹⁹⁾ succeeded by the ingenious Tycho Brahe⁽²⁰⁾ and sagacious Kepler,⁽²¹⁾ arose the learned physiologist Bacon, Vis-

(19) Nicholas Copernic (usually latinized, by adding the terminating syllable, us,) that celebrated astronomer, "whose vast genius, assisted by such lights as the remains of antiquity afforded him, explained the true system of the universe, as at present understood,"* was born at Thorn in Royal Prussia, the 19th of January, 1442. He was alike distinguished for his piety and innocence, as for his extraordinary genius and discoveries. He died in the seventy-seventh year of his age.

(20) This great man was a native of Knudstorp, a province of Scania in Denmark, and born the 18th of December, 1546, of an illustrious family. He was the first, who, by the accuracy and number of his observations, made the way for the revival of astronomy among the moderns; although, "in theory," as Rittenhouse has expressed it, "he mangled the beautiful system of Copernicus."†—Brahe (for this is the family-name) died at the age of fifty-five years.

(21) John Kepler, a native of Wiel in the duchy of Wirtemberg, in Germany, became as celebrated for the consequences

* *Ritt. Orat.*

† *Ibid.*

count of St. Albans,—one of the most illustrious contributors to the yet scanty stock of experimental philosophy.⁽²²⁾ And soon after, in the same age and nation, was manifested to the world, in the full glory of meridian splendour, that great luminary of natural science, who first enlightened mankind by diffusing among them the rays of well-ascertained truths; clearly exhibiting to all, those fundamental principles of the laws of nature, by which the grand, the stupendous system of the material universe is both sustained and governed :—

“ Nature and Nature’s Laws lay hid in night ;

“ God said, Let Newton be,—and all was Light.”

Finally, it was reserved for our own age and country to derive dignity and fame, from having given birth to an illustrious successor and disciple of that immortal

he drew from the observations of Tycho, as the latter was for the vast mass of astronomical materials he had prepared. This eminent, though somewhat “whimsical”^{*} astronomer, was born the 27th of December, 1571, and died at the age of fifty-nine years.

(22) “Before his (Bacon’s) time, philosophy was fettered by forms and syllogisms. The logics of Aristotle held the human mind in bondage for nearly two thousand years; a miserable jugglery, which was fitted to render all truth problematical, and which disseminated a thousand errors, but never brought to light one useful piece of knowledge.”—*Ld. Woolhousie’s Memoirs of the Life and Writings of Ld. Kames.*

^{*} *Ritt. Orat.*

man, in the person of the yet recently-departed
BITTENHOUSE.

The objects of a genuine philosophy, are the discovery and promulgation of the truths which emanate from a knowledge of the laws of nature, in relation to the material world, and the inseparable influence of those truths, consequent on an acquaintance with them, in giving a right direction to the moral faculty of man. The intimate connexion subsisting between natural and moral science, is indubitable; and it is equally certain, that the accordant order, fitness and rectitude, which unite into one glorious plan of wisdom, goodness and power, all portions of creation, intellectual and sensitive as well as material, must rest on the same unerring principles. The infinite variety and boundless extent of nature's works constitute a sublime system; manifesting a correspondent perfection in the design, and all-bountiful dispensation of good in its purposes.⁽²³⁾ The Almighty First Cause has founded this system on immutable principles; wherein *truth*, in relation to the moral world, may be considered as its basis,—as *fitness* is, when applied to the constitution of the natural world. These are, respectively,

(23) It is observed by an eminent philosopher of the present day, that “The more the phenomena of the universe are studied; the more distinctly their connexion appears, the more simple their causes, the more magnificent their design, and the more wonderful the wisdom and power of their Author.” (See *Elements of Chymical Philosophy*, by sir Humphrey Davy, LL.D. Sec. R. S.)

the correlatives of the one and the other : and the unity of design apparent in the whole system, plainly indicates the connexion that subsists, in the nature of things, between moral virtue, which is the result of a right perception of truth, and the fitness and order, to which all the operations of the material universe conform.⁽²⁴⁾—Towards an investigation of *these* things,

(24) On looking into Maclaurin's Account of Sir Isaac Newton's Philosophical Discoveries, since penning the above, the writer of these Memoirs was much gratified by the perusal of the following passage, in the last chapter of that valuable work ; wherein its author treats "Of the Supreme Author and Governor of the Universe, the True and Living God." The writer is induced to add it in a note, to his own reflections on the same subject, such as he has ventured to offer them in the text ; presuming that the authority of so eminent a philosopher as Mr. Maclaurin will give weight to what he has himself advanced ; so far, at least, as there may appear to be some coincidence of sentiment on the subject.

"The plain argument for the existence of the Deity, obvious to all and carrying irresistible conviction with it, is from the evident contrivance and fitness of things for one another, which we meet with throughout all parts of the universe. There is no need of nice and subtle reasonings in this matter : a manifest contrivance immediately suggests a contriver. It strikes us like a sensation ; and artful reasonings against it may puzzle us, but it is without shaking our belief. No person, for example, that knows the principles of optics, and the structure of the eye, can believe that it was formed without skill in that science ; or that the ear was formed, without the knowledge of sounds :"—"All our accounts of nature are full of instances of this kind. The admirable and beautiful order of things, for final causes, exalt our idea of the Contriver : the unity of design shews him to be One. The great motions in the system, performed with the same facility as the least, suggest his Almighty Power ; which gave motion to the earth and the celestial bodies, with equal ease as to

the researches of the great American philosopher were eagerly directed : such were the objects of his unwearied pursuit ; and such were the views entertained by him, of the utility and importance of those sublime branches of knowledge, which he cultivated so ardently and successfully.⁽²⁵⁾

the minutest particles. The subtilty of the motions and actions in the internal parts of bodies, shews that His influence penetrates the inmost recesses of things, and that He is equally active and present every where. The simplicity of the laws that prevail in the world, the excellent disposition of things, in order to obtain the best ends, and the beauty which adorns the works of nature, far superior to any thing in art, suggest His consummate Wisdom. The usefulness of the whole scheme, so well contrived for the intelligent beings that enjoy it, with the internal disposition and moral structure of those beings themselves, shew His unbounded goodness. These are arguments which are sufficiently open to the views and capacities of the unlearned, while at the same time they acquire new strength and lustre from the discoveries of the learned. The Deity's acting and interposing in the universe, shew that He governs it, as well as formed it ; and the depth of His counsels, even in conducting the material universe, of which a great part surpasses our knowledge, keeps up an inward veneration and awe of this great Being, and disposes us to receive what may be otherwise revealed to us, concerning Him."

(25) Mr. Cotes, in his preface to the second edition of Sir Isaac Newton's *Principia*, exposes the folly of those depraved dreamers in philosophy, "the sordid dregs of the most impure part of mankind," who strive to maintain, that the constitution of the world is not derived from the will of God, but from a certain necessity of nature ; that all things are governed by *fate*, not by Providence ; and that matter, by *necessity of nature*, has existed always and every where, and is infinite and eternal. He then adds :—"We may now, therefore, take a nearer view of nature in

The enlightened part of the people have, in every civilized nation and in all ages, very rationally valued themselves on their great men. It is both useful and proper to commemorate the renown of such as have approved themselves, in an eminent degree, Benefactors of Mankind. The Life, therefore, of so distinguished a Philosopher as RITTENHOUSE, must be expected to interest the feelings, as well as the curiosity, of the good and the wise, not only of our own country but of foreign nations.

With respect to the usefulness and importance of that majestic science, which was the favourite study and principal object of the pursuit of our philosopher, during a life of ordinary extent but of very extraordinary attainments and character, something may with propriety be said, with a view to an illustration of the subject. And among other evidence, which, it is presumed, may not be unaptly adduced on the occasion, the Memorialist will cite in the first place, as well as occasionally afterwards, the sentiments of a distinguished foreign astronomer, whose abilities and erudition rendered him eminently qualified to decide, in a discussion of this nature : He shall be made to speak

her glory, and contemplate her in a most entertaining manner : and withal, more zealously than ever, pay our worship and veneration to the Creator and Lord of the Universe ; *which is the principal advantage of philosophy.* He must be blind who, from the most excellent and most wise structure of the creatures, does not presently see the infinite wisdom and goodness of their Creator : and he must be mad, who will not own those attributes."

for himself, though not in his own tongue; the great work from which the quoted extracts are made, being written in French.

Among the numerous and important advantages, then, resulting from astronomy, noticed by the celebrated Lalande (in the preface to his book, entitled *Astronomie*,) he remarks that it is well known, that besides the tendency of this science to dissipate many vulgar errors and prejudices,⁽²⁶⁾ cosmography and

(26) "A man would deceive himself," says Lalande, "in believing he could be a philosopher, without the study of the natural sciences. To be wise, not by weakness, but by principles, it is necessary that, to be able to reflect and think with vigour, we be freed from those prejudices which deceive the judgment, and which oppose themselves to the development of reason and of genius. Pythagoras would not have any disciples, who had not studied Mathematics: over his door was to be read, that "no one was to enter, unless he were a geometrician."—Morals would be less sure, and less attractive for us, if they were to be founded on ignorance or on error.

"Ought we," he asks, "to consider as of no importance the advantage of being freed from the misfortunes of ignorance? Is it possible to observe, without a feeling of compassion and even of shame, the stupidity of those, who formerly believed, that by making a great vociferation, during an eclipse of the Moon, they furnished relief to the sufferings of that (imagined) goddess; or, that these eclipses were produced by enchantment?"

"Cum frustra resonant æra auxiliaria Lunæ."

Met. iv. 333.

Reyas, in the dedication of his Commentaries on the Planisphere to the Emperor Charles V. mentions a curious historical fact, in illustration of the effects of that superstition, derived

geography cannot go on, but by its means : that the discovery of the satellites of Jupiter has given greater

from ignorance, which astronomy has banished from the civilized world. It is thus related by Lalande :—" Christopher Columbus, when commanding the army which Ferdinand, king of Spain, had sent to Jamaica, some short time after the discovery of that island, experienced so great a scarcity of provisions, that no hope remained of saving his army, which he expected to be soon at the mercy of the savages. An approaching eclipse of the moon furnished this able man with the means of extricating himself from his embarrassment : he let the chief of the savages know, that if they should not, in a few hours, send him all he asked for, he would oppress them with the greatest calamities; and that he would begin by depriving the moon of her light. At first, they contemned his menaces ; but, when they saw that the moon began, in reality, to disappear, they were seized with terror ; they carried all they had to the general, and came themselves to implore forgiveness."

Comets were formerly, even in civilized nations, another great cause of consternation among the people ; and one, also, which a knowledge of astronomy has at length divested of its terrors, by removing the source of those superstitious errors, a grossly mistaken notion of the nature of those phænomena. " We are sorry to find," says Lalande, " such strange prejudices, not only in Homer [*Iliad* iv. 75.] but even in the most beautiful poem of the sixteenth century ; whereby means are furnished of perpetuating our errors—

" Qual con le chiome sanguinose orrende
Splendor Cometa suol per l'aria adusta,
Che i regni muta e i ferì morbi adduce,
E ai purpurei tiranni infausta luce."

Tasso's Jerus. del.

Which Mr. Hoole has thus translated—

" As, shaking terrors from his blazing hair,
A sanguine Comet gleams through dusky air,

perfection to our geographical and marine charts, than they could have attained by ten thousand years of navigation and voyages;⁽²⁷⁾ and, that when their theory

To ruin states, and dire diseases spread,
And baleful light on purpled tyrants shed."

Further, the progress of genuine astronomy has almost wholly dissipated, in our day, the gross delusions of astrology, with the mischievous portents of its infatuated judicial interpreters; follies engendered by ignorance, which is, ever, the prolific parent of prejudice, of superstition, and of their numerous concomitant evils.

{27} Mr. Rittenhouse observes, (in his Oration delivered before the American Philosophical Society, in 1775,) that "Galileo not only discovered these moons of Jupiter, but suggested their use in determining the longitude of places on the earth; which has since been so happily put in practice, that Fontenelle does not hesitate to affirm, they are of more use to geography and navigation, than our own moon."—This great man, one of the first restorers of the true principles of physics, was condemned by, and suffered the penalties of the Inquisition, in 1535, for defending the system of Copernicus! He died in 1542.

A letter from Andrew Ellicott, Esq. to Mr. Robert Patterson; dated the 2d of April 1795, and published in the fourth volume of the American Philosophical Society's Transactions, contains sundry observations of the immersions of the satellites of Jupiter, made at Wilmington in the state of Delaware, by Messrs. Rittenhouse, J. Page, Lukens and Andrews, respectively, on divers days from the 1st to the 23d of August (both included,) in the year 1784; together with those observed at the Western Observatory, by Messrs. Ellicott, Ewing, Madison, &c. on divers days from the 17th of July to the 19th of August (both included,) in the same year: also, of the emersions of those satellites, by the same Eastern Observers, from the 29th of August to the 19th of September (both included,) and by the same Western Observers, from the 27th of August, up to the 19th of September, both included; all in the year 1784. These observations were made,

shall become still better known, the method of determining the longitude at sea will be more exact and more easy.

“It is to astronomy,” says Mr. Lalande, “that we are indebted for the first voyages of the Phœnicians, and the earliest progress of industry and commerce: it is likewise to it, that we owe the discovery of the New World. If there remain any thing to desire for the perfection and scarcity of navigation, it is, to find the longitude at sea.” In continuation, he says:—

“The utility of navigation for the welfare of a state, serves to prove that of astronomy. But it seems to me, that it is difficult for a good citizen to be ignorant, now, of the usefulness of navigation; above all, (says Lalande, feelingly,) in France. The success of the English, in the war of 1761, has but too well shewn, that a marine alone governs the fortune of empires, their power, their commerce; that peace and war are decided on the ocean; and that, in fine, as Mr. Miere has expressed it,—

“Le Trident de Neptune est le Sceptre du Mond.”*

when those able geometricians and astronomers were employed in ascertaining the Western Boundary of Pennsylvania, by determining the length of five degrees of longitude, West, from a given point on the river Delaware.

* “The trident of Neptune is the sceptre of the world.”—This, as Lalande observes, is nearly what Themistocles said at Athens, Pompey at Rome, Cromwell in England, and Richelieu and Colbert in France.

“Ancient chronology deduces from a knowledge and calculation of eclipses, the best established periods in time, that it is possible to obtain : and in ages anterior to regular observations, nothing but obscurity is to be met with. We should not have in the history of nations any uncertainty in dates, if there had always been astronomers. We may perceive, above all, the connexions of astronomy in *The Art of verifying Dates*. It is by an eclipse of the Moon,⁽²⁸⁾ that we discover the error of date that exists in the vulgar era with respect to the birth of Christ. It is known that Herod was king of Judea, and that there was an eclipse of the moon immediately before the death of that prince : we find this eclipse was in the night, between the 12th and 13th of March, of the fourth year before the vulgar era ; so that this era ought to be removed three years back, at least.

“It is besides from astronomy, that we borrow the division of time in the common transactions of life, and the art of regulating clocks and watches. We

(28) Mr. Derham, speaking of the utility resulting from the observation of these phenomena, (in his *Astro-Theology*,) says—
 “As to the eclipses, whether of sun or moon, they have their excellent uses. The astronomer applies them to considerable services, in his way, and the geographer makes them no less useful in his : the chronologer is enabled, by them, to amend his accounts of time, even of the most ancient days ; and so down through all ages : and the mariner, too, can make them serviceable to his purpose, to discover his longitude, to correct his account at sea, and thereby make himself more secure and safe in the untrodden paths of the deep.”

W. B.

may say, that the order and the multiplicity of our affairs, of our duties, our amusements; the attachment to exactness and precision; in short, our habits; all have rendered this measure of time almost indispensable, and placed it among the number of the *desiderata* of human life.

“If, for want of clocks and watches, we should be under the necessity of recurring to meridians and sundials, even this would further prove the advantages derived from astronomical science; since dialling is only an application of spherical trigonometry and astronomy.

“Le Sage is displeased with good reason with those, whom an admiration of the stars has carried so far, as that they fancied them to be Deities:⁽²⁹⁾ but,

(29) Lucius Cælius Lactantius Firmianus, a Christian writer in the beginning of the fourth century, reasons in a conclusive manner against the heathen mythology, in the inference he draws from the argument, used by the heathens, to prove the heavenly bodies to be divinities. His argument, on this head, will be found towards the conclusion of Mr. Derham’s *Astro-Theology*, where it is translated from the Latin of that early and eloquent advocate of Christianity (in his *Divin. Instit.* l. 2. c. 5.) in these words:—

“That argument whereby they” (those idolaters) “conclude the heavenly bodies to be gods, proveth the contrary: for if therefore they think them to be gods, because they have such certain and well-contrived rational courses, they err: for, from hence it appears that they are not gods; because they are not able to wander out of those paths that are prescribed them. Whereas, if they were gods, they would go here and there, and every where, without any restraint, like as animals upon the earth

far from condemning the study of them, he recommends it, for the glory of the Creator."

do; whose wills being free, they wander hither and thither, as they list, and go whithersoever their minds carry them."

Those vast orbs of matter in the universe, which constitute the planets of our system, if even we consider this alone, and each of which is known to have its appropriate motion, must of necessity have had those motions communicated to them, at first, by some Being of infinite power; the perfect order and regularity of their motions render it equally plain, that that Being was also infinite in wisdom; and the uninterrupted continuance of the same regularity of motion, in their respective orbits, demonstrates in like manner, that He who originally imparted their motions to the several planets is, moreover, infinite in duration.

The *vis inertiae* of all *material* substances, a quality inseparably interwoven with their nature, deprives them (considered merely as such) of the power of spontaneous motion; matter is inherently *inert*: consequently, those great globes of matter, the planets (including the earth,) necessarily derive their motions from a supremely powerful First Cause, as well as from one infinitely intelligent, and everlasting in his Being. Hence, Lactantius well observes, in another place, that "There is, indeed, a power in the stars, of performing their motions; but that is the power of God, who made and governs all things; not of the stars themselves, that are moved."

The reasoning of Lactantius, on this subject, is more worthy of a philosopher, than that employed by Descartes, in supporting his chimerical notion of vortices; or than that which led Kepler to adopt his scheme, equally unsupported by any rational principles, of a vectorial power produced by emanations of the sun, as primary agents of motion in the solar system. Because these schemes of Descartes and Kepler make it necessary to recur to some ulterior, as well as more adequate and comprehensible cause of motion, in the planets, than either vortices or emanations from the sun: whereas Lactantius resorted, at once, to an intelligent First Cause, capable of producing the effect; without conjuring up inefficient agents, as first movers; which left them still under the necessity of going back to a CREATOR of their

Adverting to such as considered "fire, or wind, or the swift air, or the circle of the stars, or the violent water, or the lights of heaven, to be gods which govern the world,"⁽³⁰⁾ he applies the words of Solomon:—"With whose beauty, if they, being delighted, took them to be gods; let them know how much better the Lord of them is: for the first Author of beauty has created them—For, by the greatness and beauty of the creatures, proportionably the Maker of them is seen."⁽³¹⁾

"David found also, in the stars," continues Lalande, "means of elevating his contemplation of the Deity:"—"The heavens declare the glory of God;"⁽³²⁾ "I will view thy heavens, the works of thy fingers, the moon and the stars which thou hast established:" and we see that Mr. Derham has called by the name of "*Astro-Theology*," a work, in which is presented, in all their force, the singularity and grandeur of the

respective causes (but second causes, at best,) of the planetary motions; consequently, the First Cause; and, also, of admitting the existence of Intelligence, as an essential attribute in the nature of that Being.

An edition of the works of Lactantius (who was a native of Fermo in Italy,) was printed at Leipsick, in 1715.

(30) Wisdom of Solomon, ch. 13. v. 2.

(31) Ibid. ch. 13. v. 3 and 5.

(32) Psalm 19. v. 1.

discoveries that have been made in astronomy ; as being so many proofs of the existence of a God. (See what Aristotle thought on this subject, in the eighth book of his *Physics*.”)

Such were the reflections of Mr. Lalande, on a subject with which he was intimately acquainted.

The opinions of eminent and enlightened men have deservedly great weight, in all those matters on which it is presumable, from the nature of their pursuits, their thoughts have been most employed. Notwithstanding, therefore, the fulness of the foregoing extracts, the writer believes that the very apt and judicious observations contained in the following passage, in support of similar sentiments, extracted from a voluminous work of a distinguished English astronomer, of the present day, will not be deemed to have been improperly brought into view, on this occasion :—

“The obvious argument of the existence of a DEITY, who formed and governs the universe,” (says Mr. Vince, the author referred to,) “is founded upon the uniformity of the laws which take place in the production of similar effects ; and from the simplicity of the causes which produce the various phenomena. The most common views of nature, however imperfect and of small extent, suggest the idea of the government of a God, and every further discovery tends to confirm that persuasion. The ancient philosophers,

who scarce knew a single law by which the bodies in the system are governed, still saw the DEITY in his works : how visible therefore ought He to be to us, who are acquainted with the laws by which the whole is directed. The same law takes place in our system, between the periodic times and distances of every body revolving about the same centre. Every body describes about its respective centre equal areas in equal times. Every body is spherical. Every planet, as far as our observations reach, is found to revolve about an axis; and the axis of each is observed to continue parallel to itself. Now as the circumstances which might have attended these bodies are indefinite in variety, the uniform similarity which is found to exist amongst them, is an irrefragable argument of design. To produce a succession of day and night, either the sun must revolve every day about the earth, or the earth must revolve about its axis : the latter is the most simple cause ; and, accordingly, we find that the regular return of day and night is so produced. As far also as observations have enabled us to discover, the return of day and night, in the planets, is produced by the operation of a similar cause. It is also found, that the axis of each planet is inclined to the plane of its orbit, by which a provision is made for a variety of seasons ; and by preserving the axis always parallel to itself, summer and winter return at their stated periods. Where there are such incontestable marks of design, there must be a DESIGNER ; and the unity of design through the whole system, proves it to

be the work of ONE. The general laws of nature shew the existence of a Divine INTELLIGENCE, in a much stronger point of view, than any work of man can prove him to have acted from intention ; inasmuch as the operations of the former are uniform, and subject to no variation ; whereas in the latter case, we see continual alterations of plan, and deviations from established rules. And without this permanent order of things, experience could not have directed man in respect to his future operations. These fixed laws of nature, so necessary for us, is an irresistible argument that the world is the work of a wise and benevolent BEING. The laws of nature are the laws of God ; and how far soever we may be able to trace up causes, they must terminate in his will. We see nothing in the heavens which argues imperfection ; the whole creation is stamped with the marks of DIVINITY.”— [See *A Complete System of Astronomy* ; by the Rev. S. Vince, A. M. F. R. S. &c. printed at Cambridge, in 1799—vol. ii. p. 290, 291.]

None of the works of creation present to the contemplation of man objects more worthy of the dignity of his nature, than those which engage the attention of the astronomer. They have interested men of the sublimest genius, in all ages of the world ; and the science of astronomy is spoken of with admiration, by the most celebrated sages of antiquity.

Although no astronomer of our day, how enthusiastic soever he may be in favour of his science, will be disposed to say with Anaxagoras, that the purpose for which he himself or any other man was born, was, that he might contemplate the stars; yet it does seem, as if the objects of this science more naturally attracted the attention and employed the research of elevated minds, than those things, within the narrow limits of this world, an acquaintance with which constitutes the ordinary mass of human knowledge. The disposition of man to direct his eyes frequently upwards, and the faculty to do so, arising from his erect figure and the position and structure of the organs of his vision, furnish no feeble argument in proving, that this temporary lord of his fellow-beings on this globe has nobler destinies, infinitely beyond them; being enabled and permitted by the Author of his being, even while in this circumscribed state of his existence, to survey those myriads of worlds which occupy the immensity of space; to contemplate their nature, and the laws that govern them; thence, to discern, with the eye of reason, the Great First Cause of their being;⁽³³⁾ and thus having acquired a juster knowledge of his own

(33) In Mr. Smart's *Poetical Essay on the Immensity of the Supreme Being*, after a glowing description of some of the admirable works of nature, is this apt, though laconic address to the Atheist:—

“Thou ideot! that asserts, there is no God,
View, and be dumb for ever.”

nature, to grasp at an endless futurity for its existence.

That the erect countenance and upward aspect of the human species were his peculiar endowments by the Deity, for these purposes among others, appears to have been the impression on the mind of Ovid, when he said :—

“ Finxit in effigiem moderantum cuncta deorum;
Pronaque cum spectent anamalla cætera terram,
Os homini sublime dedit, cælumque tueri
Jussit, et erectos ad sidera tollere vultus.”⁽³⁴⁾

Met. i. 88.

(34) The poet gives a whimsical account of the first formation of man, out of this earth, which is represented as being then new; and, having been recently separated from the high æther, is therefore supposed as yet holding some affinity with heaven, and retaining its seeds. He describes the son of Japetus (Prometheus) moulding a portion of earth, mixed with river-water, into the similitude of those heathen deities, who were said to rule over all things. §

A poetic translation into our own language, of the lines above quoted, which exhibit “the godlike image,” thus formed, after its being animated by the stolen fire of Prometheus, is comprehended in the *italicised* lines of the following passage, extracted from Mr. Dryden’s versification of the first book of Ovid’s *Metamorphoses*; in which the English poet has well preserved the beauty, the force, and the sublimity of the thought, so finely expressed in the original :—

“ A creature of a more exalted kind
Was wanting yet, and then was *Man* design’d;

Mr. Pope has well observed, that—

“The proper study of mankind, is Man :”—

But, in order that he may be enabled to know himself, it is indispensably necessary for him to acquire such a knowledge of other created beings that surround him, as the limited nature of his faculties will allow. He must attentively observe the operations of nature in the material universe, survey with a reflecting mind its stupendous fabric, and study its laws. Hence, he will be made acquainted, and although in a partial, yet not an inconsiderable degree, with the powers and extent of that intellectual principle which he finds in the government of the moral, as well as the natural world. And being thus enabled to know his own proper standing in creation, and his appropriate relation to all its parts, he will by these means be qua-

Conscious of thought, of more capacious breast,
For empire form'd, and fit to rule the rest :
Whether with particles of heav'nly fire
The God of nature did his soul inspire ;
Or earth, but now divided from the sky,
And pliant still, retain'd th' ætherial energy :
Which wise *Prometheus* temper'd into paste,
And, mixt with living streams, the godlike image cast :
Thus, while the mute creation downward bend
Their sight, and to their earthly mother tend,
Man looks aloft, and with erected eyes
Beholds his own hereditary skies."

lified to ascend to those enquiries, which will open to his mind a just sense of the attributes of the Deity, of whose existence he will feel a perfect conviction. In this way, will man obtain a due knowledge of his own "being, end and aim ;" and become fully sensible of his entire dependence on his Creator : while he will thereby learn, that he incessantly owes him the highest adoration and the most devoted service.⁽³⁵⁾ In this

(35) Man will, unquestionably, by taking an extensive range in the contemplation of nature, proportionably enlarge his intuitive conceptions of the attributes of her Almighty First Cause ; of whose transcendently exalted existence, the study of his own being, one of nature's greatest works, will have taught him the reality : and a due knowledge of himself, alone, will also instruct him in the dependent nature of his condition, and the duties resulting from that state of dependence, in his humble relation to the Supreme being.

Mr. Smart, in the poem before quoted, has prettily expressed this idea, in the following lines :—

" Vain were th' attempt, and impious, to trace
Thro' *all* his works th' Artificer Divine—
And tho' no shining sun, nor twinkling star,
Bedeck'd the crimson curtains of the sky ;
Tho' neither vegetable, beast, nor bird,
Were extant on the surface of this ball,
Nor lurking gem beneath ; tho' the great sea
Slept in profound stagnation, and the air
Had left no thunder to pronounce its Maker ;
Yet Man at home, *within himself*, might find
The Deity immense ; and, in that frame
So fearfully, so wonderfully made,
See and adore his Providence and Pow'r."

way it is, that the philosopher, more especially the astronomer,—

“ Looks, through Nature, up to Nature’s God.”⁽³⁶⁾

Pope’s Ess. on Man.

Besides the various and important uses of astronomy, here pointed out, it is connected, by means of numerous ramifications, with other departments of science,

(36) The same sentiment is beautifully expressed by Thomson, in the following apostrophe :

“ With thee, serene Philosophy ! with thee,
And thy bright garland, let me crown my song !
Effusive source of evidence, and truth !
A lustre shedding o’er th’ ennobled mind,
Stronger than summer-noon ; and pure as that,
Whose mild vibrations soothe the parted soul,
New to the dawning of celestial day.
Hence through her nourish’d pow’rs, enlarged by thee,
She springs aloft, with elevated pride,
Above the tangling mass of low desires,
That bind the fluttering crowd ; and angel-wing’d,
The heights of science and of virtue gains,
Where all is calm and clear ; with nature round,
Or in the starry regions, or th’ abyss,
To reason’s or to fancy’s eye display’d :
The *First* up-tracing, from the dreary void,
The chain of causes and effects to Him,
The world producing essence, who alone
Possesses being ; while the *Last* receives
The whole magnificence of heaven and earth,
And every beauty, delicate or bold,
Obvious or more remote, with livelier sense,
Diffusive painted on the rapid mind.”

Summer, l. 1729 and seq.

directed to some of the most useful pursuits of human life. Lalande has even shewn us, in the preface to his *Astronomie*, in what manner this science has a relation to the administration of civil and ecclesiastical affairs, to medicine, and to agriculture. A knowledge of astronomy is obviously connected, by means of chronology, with history. It is even a necessary study, in order to become acquainted with the heathen mythology ; and many beautiful passages in the works of the ancient poets can neither be distinctly understood nor properly relished, without a knowledge of the stars : nay, that finely poetical one, in the book of Job, in which the Deity is represented as manifesting to that patient man of affliction and sorrow the extreme imbecility of his nature, is unintelligible without some knowledge of astronomy :—

“ Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion ?—

Canst thou bring forth Mazzaroth in his season ; or canst thou guide Arcturus, with his sons ?”

Some of the greatest poets of antiquity were in a manner fascinated, by the grandeur of that science, (though they accompanied it with mystical notions,) which furnishes the sublimest objects in nature to the contemplation of the astronomer.

Ovid tells us, he wished to take his flight among the stars :

————— “Juvat ire per alta
Astra ; juvat, terris et inertī sede relictis,
Nube vehi, validique humeris insistere Atlantis.”⁽³⁷⁾

Metamorph. lib. xv.

And Horace acquaints us with the objects of curiosity and research, in the contemplation of which he envied his friend Iccius, who was occupied in that way, on his farm :—

“Quæ mare compescant causæ, quid temperet annum ;
Stellæ sponte suâ, jussæne, vagentur et errant,
Quid premat obscurum Lunæ, quid proferat orbem.”⁽³⁸⁾

Lib. i. epist. 12, ad Iccium.

(37) It delights me to soar among the lofty stars ; it delights me to leave the earth and this dull habitation, to be wafted upon a cloud, and to stand upon the shoulders of the mighty Atlas.

Mr. Dryden has thus translated the original into English verse :—

“Pleas’d, as I am, to walk along the sphere
Of shining stars, and travel with the year ;
To leave the heavy earth, and scale the height
Of Atlas, who supports the heavenly weight.”

(38) Dr. Francis thus versifies this passage, in our language :—

————— “What bounds old ocean’s tides ;
What, through the various year, the seasons guides :
Whether the stars, by their own proper force,
Or foreign pow’r, pursue their wand’ring course :
Why shadows darken the pale Queen of Night ;
Whence she renews her orb, and spreads her light :

Virgil seemed willing to renounce every other study, in order that he might devote himself to the wonders of astronomy. In the second book of his *Georgics*, he says :

" Me vero primum dulces ante omnia Musæ,
Quarum sacra fero, ingenti percussus amore,
Accipiant ; cælique vias et sidera monstrent,
Defectus Solis varius, Lunæque labores ;
Unde tremor terris, quâ vi maria alta tumescant
Obicibus ruptis, rursusque in se ipsa resident ;
Quid tantum oceano properent se tingere soles
Hyberni, vel quæ tardis mora noctibus obstet—
Felix qui potuit rerum cognoscere causas."⁽³⁹⁾

l. 475 and seq.

And, in addition to these classical writers, a modern poet (Mr. Voltaire) appears, by a letter written in the year 1738, to have participated in the regrets express-

(39) Thus rendered, in English verse, by Mr. Dryden :—

" Ye sacred Muses, with whose beauty fir'd,
My soul is ravish'd, and my brain inspir'd ;
Whose priest I am, whose holy fillets wear,
Would you your poet's first petition hear ;
Give me the way of wand'ring stars to know :
The depths of heav'n above, and earth below.
Teach me the various labours of the moon,
And whence proceed th' eclipses of the sun.
Why flowing tides prevail upon the main,
And in what dark recess they sink again.
What shakes the solid earth, what cause delays
The summer nights, and shortens winter days—
Happy the man, who, studying nature's laws,
Through known effects can trace the secret cause."

ed by Virgil ; and to have been desirous of directing all his faculties towards the sciences. He produced, on the philosophy of Newton, a work which has contributed to the expansion of genius ; and, in his epistle to the Marchioness du Chatelet, he pays that great man a very exalted compliment, in these poetic lines :

“ Confidens du Tres Haut, substances eternelles,
Qui parez de vos feux, qui couvrez de vos ailes
Le trône où votre Maître est assis parmi vous ;
Parlez : Du grand Newton n’étiez-vous point jaloux ? ” (40)

Astronomy has not only engaged the attention of multitudes of illustrious men, of every age and nation,

(40) The lines here referred to were written about eight years after Sir Isaac Newton’s death. Voltaire supposes an apotheosis of Newton to have taken place, among the planets personified by some of the deities of the heathen mythology. Thus ascribing intelligence to the stars, he considers them, by a poetical fiction, as being in the *confidence* of the Most High—the *true* God ; and to those subordinate deities, or, perhaps, a fancied superior order of angelic beings, the poet makes his figurative address ; which may be thus rendered in English verse :—

Ye confidants of the Most High,
Ye everlasting lights !
Who deck, with your refulgent fires,
The scene of godlike rights !
Whose wings o’erspread the glorious throne
Whereon your Lord is plac’d,
That Lord, by whose transcendent pow’r
Your borrow’d rays are grac’d ;
Speak out, bright orbs of heaven’s expanse !
And frankly let us know :
To the exalted NEWTON’s name,
Can you refuse to bow ?

but it has been patronized by great and enlightened princes and states; cultivated by men of genius and learning, of all ranks and professions; and celebrated by historians and poets.

This charming, as well as sublime and invaluable science, has also been studied, and even practically cultivated, by many celebrated women, in modern times. There are indeed circumstances connected with this innocent and engaging pursuit, that must render it very interesting to the fair sex. Some ladies have prosecuted this object with such success, as to acquire considerable distinction in the philosophical world. While, therefore, the meritorious transactions of men are held in grateful remembrance and frequently recorded in the annals of fame, it is due to justice and impartiality, that literary, scientific, and other attainments of the gentler sex, calculated for the benefit of civil society, should be alike commemorated. Among such then, as examples, may be named the following:—

Maria Cunitia (Kunitz,) daughter of a physician in Silesia, published Astronomical Tables, so early as the year 1650.

Maria-Clara, the daughter of Eimmart and wife of of Muller, both well-known astronomers, cultivated the same science.

Jane Damée published, in the year 1680, Conversations (or Dialogues) on the Copernican System.

Maria-Margaretta Winckelman, wife of Godfrey Kirch, an astronomer of some distinction⁽⁴¹⁾ who died in 1710, at the age of seventy-one years, worked at his Ephemerides, and carried on Astronomical Observations with her husband. This respectable woman discovered the Comet⁽⁴²⁾ of 1702, on the 20th of April in that year : she produced, in 1712, a Work on Astro-

(41) Godfrey Kirch was born in the year 1640, at Guben in Lower Lusatia, and lived with Hevelius. He published his Ephemerides in 1681, and became established at Berlin in 1700. This astronomer made numerous observations.

(42) ————— “ Amid the radiant orbs
 That more than deck, that animate the sky,
 The life-infusing suns of other worlds,
 Lo! from the dread immensity of space
 Returning with accelerated course,
 The rushing Comet to the sun descends;
 And, as he sinks below the shading earth,
 With awful train projected o'er the heavens,
 The guilty nations tremble. But, above
 Those superstitious horrors that enslave
 The fond sequacious herd, to mystic faith
 And blind amazement prone, th' enlighten'd few,
 Whose godlike minds Philosophy exalts,
 The glorious stranger hail. They feel a joy
 Divinely great; they in their powers exult;
 That wond'rous force of thought, which mounting spurns
 This dusky spot, and measures all the sky;
 While, from his far excursions through the wilds
 Of barren ether, faithful to his time,
 They see the blazing wonder rise anew,
 In seeming terror clad, but kindly bent

nomy; and died at Berlin, in the year 1790. Her three daughters continued, for thirty years, to employ themselves in Astronomical Observations, for the Almanacks of Berlin.

Elizabeth d'Oginsky Puzynina, Countess Puzynina and Castellane of Mscislau, in Poland, erected and richly endowed a magnificent Observatory at Wilna, in the year 1753; and in 1767, she added to this establishment a fund equivalent to twelve thousand (American) dollars, for the purpose of maintaining an observer and purchasing instruments. The king of Poland afterwards gave to this institution the title of a "Royal Observatory."

The wife of the celebrated Hevelius was, likewise, an astronomer. Madame Hevelius made Observations along with her husband; and she is represented, in the *Machina Cœlestis*, as having been engaged in measuring distances.

In the century just passed, the Marchioness du Chatelet translated *Newton*: Besides whom,—

Madame Lepaute and Madame du Piery were both known in the Astronomical World.

To work the will of all-sustaining love:
From his huge vapoury train perhaps to shake
Renewing moisture on the numerous orbs,
Through which his long elipsal winds; perhaps
To lend new fuel to declining suns,
To light up worlds, and feed th' eternal fire."

Thomson's Summer, l. 1702 and seq.

In our own time, Miss Caroline Herschel, sister of the great practical astronomer of the same name, in England, has not only distinguished herself, by having discovered the Comet of 1786 ; another, on the 17th of April, 1790 ; and a third, on the 8th of October, 1793 ;⁽⁴³⁾ but likewise by attending to Astronomical Observations, along with her brother, for several years.

To these may be added the name of an illustrious female ; Elizabeth, eldest daughter of Frederick V. Count Palatine of the Rhine and King of Bohemia, by the only daughter of James I. This Princess (who was an aunt of King George I.) cultivated a fine genius for the several branches of natural philosophy, and was well versed in mathematical science. Although this excellent woman was a Protestant, she was Abbess of Herworden in Westphalia, where she died in 1680, at the age of sixty-two years.

Mr. Lalande, in the prefatory department of his great work on *Astronomy*, after noticing the Abbé Pluche's book, entitled *Spectacle de la Nature*, says : " The freshness of the shade, the stillness of night, the soft beams of twilight, the luminaries that bespangle the heavens, the various appearances of the moon, all form in the hands of Pluche a fit subject for fine

(43) Mr. Messier observed this Comet in France, eleven days before it was discovered in England by Miss Herschel.

descriptive colouring: it takes in view all the wants of man, regards the attention of the Supreme Being to those wants, and recognizes the glory of the Creator. His book is a treatise on final causes, as well as a philosophical work; and there are a great many young persons to whom the reading of it would afford satisfaction and pleasure." Observing that he himself had no object in view, in his own work, but merely to treat of Astronomy, Lalande recommends to his readers, *Nature Displayed*, Derham's *Astro-Theology*, and the Dialogues of Fontenelle on *The Plurality of Worlds*. Such works as these, with some elementary books on astronomy and those branches of science most intimately connected with that science, would be very proper for the study of that respectable class of females, whose minds are too elevated and correct to derive any gratification from the trifling productions of most of the modern novellists and romance-writers; but who, at the same time, might not be desirous of engaging in the more abstruse and laborious researches, which demand the attention of profound practical astronomers.⁽⁴⁴⁾ The grand, the delightful views of nature, which studies of this sort would present to the vivid imagination, the delicate sensibility, and the good dispositions of a woman of genius and refinement,

(44) That the mind of the female sex is capable of compassing great and extraordinary attainments, even in the most arduous branches of science, is attested by many instances; and it cannot be doubted that these would be more numerous, were women oftener attentive to philosophical pursuits. Those who

would not only improve her understanding and sanction the best feelings of her heart, but they would furnish her mind with an inexhaustible fund of animating reflections and rational enjoyments : in every respect, indeed, they would contribute to her happiness.

Let not, then, the beauties of astronomical science, and the captivating studies of natural philosophy in general, be exclusively enjoyed by men ; but let the amiable, the intelligent, and the improved part of the female sex, be invited to a participation, with them, in these intellectual pleasures.⁽⁴⁵⁾

have been just named serve to shew, that astronomy has been cultivated with success, by them. And Dr. Reid tells us (in his *Essays on the intellectual and active Powers of Man*,) that both the celebrated Christiana, Queen of Sweden, and the Princess Elizabeth, daughter of Frederick, King of Bohemia, and aunt of George I. were adepts in the philosophy of Descartes. The latter of these princesses, though very young when Descartes wrote his *Principia*, was declared by that philosopher to be the only person he knew, who perfectly understood not only all his philosophical writings, but the most abstruse of his mathematical works.

(45) The writer is happy in having it in his power to cite, in support of his own opinion, that of an amiable and conspicuous female, in favour of ladies making themselves acquainted with, at least, the rudiments of astronomical science.

The Countess of Carlisle, a woman whose literary attainments, as well as virtues and accomplishments, do honour to her sex and station, in her Letters, under the signature of *Cornelia*, thus recommends an attention to the study of astronomy, to the young ladies to whom her letters are addressed.

Here, perhaps, might be rested the evidence of the all-important usefulness of that branch of knowledge, in which our American Philosopher was pre-eminently distinguished.

But, inasmuch as astronomy forms a part of mathematical science, more especially of those branches of it, which, under the denomination of mixed and practical mathematics, are intimately and inseparably interwoven, every where, with physical considerations, the reader will, it is presumed, be gratified by a perusal of the following admirable description of the *Uses of Mathematics*, extracted from the great Dr. Barrow's *Prefatory Oration*,⁽⁴⁶⁾ upon his admission into the Professorship, at Cambridge. Indeed, in writing the Life of a man so eminently skilled as Dr. Rittenhouse was, in the several departments or various branches of natural philosophy, it seems proper

"Attain a competent knowledge of the globe on which you live, that your apprehension of Infinite Wisdom may be enlarged; which it will be in a much higher degree, if you take care to acquire a general idea of the structure of the universe. It is not expected you should become adepts in astronomy; but a knowledge of its leading principles you may, and ought to obtain."—Her ladyship then refers her young female correspondents to the *Plurality of Worlds* of Fontenelle, in order that they might acquire a knowledge of the planetary orbs; pleasantly recommending this author as a proper person, in the capacity of "a gentleman usher," to "introduce" them to an "acquaintance" with "that brilliant assembly."

Lady Carlisle's Letters, lett. 8th.

(46) Translated from the Latin.

and useful to exhibit to the reader such views as have been furnished by men of renowned erudition, of the nature and importance of that complicated, that widely-extended science, in the cultivation of which our philosopher held so exalted a rank.

Dr. Barrow⁽⁴⁷⁾ thus eulogizes the Mathematics—a science “which depends upon principles clear to the mind, and agreeable to experience; which draws certain conclusions, instructs by profitable rules, unfolds pleasant questions, and produces wonderful effects: which is the fruitful parent of—I had almost said—all arts, the unshaken foundation of sciences,

(47) This very eminent mathematician, as well as learned and pious divine, died in the year 1677, aged only forty-seven years. See the life of this extraordinary man, written in 1683, by the learned Abraham Hill; prefixed to the first volume of the doctor's theological works; a fifth edition of which, in three folio volumes, was published by archbishop Tillotson, in 1741. He also wrote and published many geometrical and mathematical works, all in Latin.

“The name of Dr. Barrow,” says Mr. Granger, one of his biographers, “will ever be illustrious, for a strength of mind and a compass of knowledge that did honour to his country. He was unrivalled in mathematical learning, and especially in the sublime geometry, in which he was excelled only by one man; and that man was his pupil, the great Sir Isaac Newton. The same genius that seemed to be born only to bring hidden things to light, to rise to the heights or descend to the depths of science; would sometimes amuse itself in the flowery paths of poetry, and he composed verses both in Greek and Latin.”

This “prodigy of learning,” as he is called by Mr. Granger, was interred in Westminster Abbey, where a monument, adorned with his bust, is erected to his memory.

and the plentiful fountain of advantage to human affairs : In which last respect we may be said to receive from mathematics the principal delights of life, securities of health, increase of fortune and conveniences of labour : That we dwell elegantly and commodiously, build decent houses for ourselves, erect stately temples to God, and leave wonderful monuments to posterity : That we are protected by these rampires from the incursions of an enemy, rightly use arms, artfully manage war, and skilfully range an army : That we have safe traffic through the deceitful billows, pass in a direct road through the trackless ways of the sea, and arrive at the designed ports by the uncertain impulse of the winds : That we rightly cast up our accounts, do business expeditiously, dispose, tabulate, and calculate scattered ranks of numbers, and easily compute them, though expressive of huge heaps of sand, nay immense hills of atoms : That we make pacific separations of the bounds of lands, examine the momentums of weights in an equal balance, and are enabled to distribute to every one his own by a just measure : That, with a light touch, we thrust forward bodies, which way we will, and stop a huge resistance with a very small force : That we accurately delineate the face of this earthly orb, and subject the economy of the universe to our sight : That we aptly digest the flowing series of time ; distinguish what is acted, by due intervals ; rightly account and discern the various returns of the seasons ; the stated periods of the years and months, the alternate increasements

of days and nights, the doubtful limits of light and shadow, and the exact difference of hours and minutes : That we derive the solar virtue of the sun's rays to our uses, infinitely extend the sphere of light, enlarge the near appearances of objects, bring remote objects near, discover hidden things, trace nature out of her concealments, and unfold her dark mysteries : That we delight our eyes with beautiful images, cunningly imitate the devices and portray the works of nature ; imitate, did I say ? nay excel ; while we form to ourselves things not in being, exhibit things absent, and represent things past : That we recreate our minds, and delight our ears, with melodious sounds ; temperate the inconstant undulations of the air to musical tones ; add a pleasant voice to a sapless log ; and draw a sweet eloquence from a rigid metal ; celebrate our Maker with an harmonious praise, and not unaptly imitate the blessed choirs of heaven : That we approach and examine the inaccessible seats of the clouds, distant tracts of land, unfrequented paths of the sea ; lofty tops of mountains, low bottoms of valleys, and deep gulphs of the ocean : That we scale the ethereal towers ; freely range through the celestial fields ; measure the magnitudes and determine the interstices of the stars ; prescribe inviolable laws to the heavens themselves, and contain the wandering circuit of the stars within strict bounds : Lastly, that we comprehend the huge fabric of the universe ; admire and contemplate the wonderful beauty of the divine

workmanship, and so learn the incredible force and sagacity of our own minds by certain experiments, as to acknowledge the blessings of heaven with a pious affection."

The honours that have been rendered to celebrated men in almost every age of the world, and by all nations concerning which we have any historical memorials, are noticed by numberless writers, both ancient and modern. The cultivation of astronomical science had, doubtless, its origin in the remotest ages of antiquity,⁽⁴⁸⁾ through the Chaldeans,⁽⁴⁹⁾ the Egyptians, the

(48) Flavius Josephus informs us, (in his *Jewish Antiquities*, b. i. chap. 7. 8.) that the sons of Seth employed themselves in astronomical contemplations. According to the same historian, Abraham inferred the unity and power of God, from the orderly course of things both at sea and land, in their times and seasons, and from his observations upon the motions and influences of the sun, moon and stars. He further relates, that this patriarch delivered lectures on geometry and arithmetic to the Egyptians, of which they understood nothing, until Abraham introduced those sciences from Chaldea into Egypt, from whence they passed into Greece: and, according to Eupolemus and Artapan, he instructed the Phœnicians, as well as the Egyptians, in astronomy.

(49) We are informed by some ancient writers, that when Babylon was taken, Calisthenes, one of Aristotle's scholars, carried from thence, by the desire of his master, celestial observations made by the Chaldeans, nearly two thousand years old; which carried them back to about the time of the dispersion of mankind by the confusion of tongues: and those observations are supposed to have been made in the famous temple of Belus, at Babylon. But these accounts are not to be depended

Phœnicians and Greeks, the Arabs, and the Chinese. But the Indians of the western hemisphere appear to have had little knowledge of astronomy, at the time of Columbus's discovery, yet they were not inattentive to its objects: for Acosta tells us, that the Peruvians observed the equinoxes, by means of columns erected before the temple of the sun at Cusco, and by a circle traced around it. Condamine likewise relates, that the Indians on the river of the Amazons gave to the Hyades, as we do, the name of the Bull's-head; and Father Lasitau says, that the Iroquois called the same

on: because Hipparchus and Ptolemy could find no traces of any observations made at Babylon before the time of Nabonassar, who began his reign 747 years before the birth of Christ; and various writers, among the ancients, agree in referring the earliest Babylonian observations to about the same period. In all probability, the Chaldean observations were then little more than matters of curiosity; for, even in the three or four centuries immediately preceding the Christian era, the celestial observations which were made by the Greeks were, for the most part, far from being of any importance, in relation to astronomical science.

Indeed, the knowledge of astronomy at much later periods than those in which the most celebrated philosophers of Greece flourished, must have been very limited and erroneous, on account of the defectiveness of their instruments. And, added to the great disadvantages arising from this cause, the ancients laboured under the want of a knowledge of the telescope and the clock; and also maintained a false notion of the system of the world; which was almost universally adhered to, until the revival and improvement of the Pythagorean system by Copernicus, who died in 1543. Within the last two hundred years, but, particularly, since the laws of nature have been made manifest by the labours and discoveries of the immortal NEWTON, the science of astronomy has made astonishing advances towards perfection.

stars the Bear, to which we give that name; and designated the Polar star by the appellation of the immoveable star. Captain Cook informs us, that the inhabitants of Taiti, in like manner, distinguish the different stars; and know in what part of the heavens they will appear, for each month in the year; their year consisting of thirteen lunar months, each being twenty-nine days.

Astronomy has been patronised by many great princes and sovereign states. Lalande observes, that, about the year 1230, the Emperor Frederick II.⁽⁵⁰⁾ prepared the way for the renewal of the sciences among the moderns, and professed himself to be their protector. His reign, according to the great French astronomer just mentioned, forms the first epocha of the revival of astronomy in Europe.

(50) This sovereign re-established the university of Naples, founded that of Vienna in Austria, in the year 1237, and imparted new vigour to the schools of Bologna and Salerno. He caused many ancient works in medicine, and philosophy to be translated from the Arabian tongue; particularly, the *Almagest* of Ptolemy.

Cotemporary with the Emperor Frederick II. was Alphonso X. King of Castile, surnamed *the Wise*. This prince was the first who manifested a desire of correcting the *Tables of Ptolemy*. In the year 1240, even during the life of his father, he drew to Toledo the most experienced astronomers of his time, Christians, Moors, or Jews; by whose labours he at length obtained the *Alphonstine Tables*, in 1252 (the first year of his reign:) which were first printed at Venice, in 1483. He died in the year 1284.

Coeval with that sovereign, was *Johannes de Sacro-Bosco*,⁽⁵¹⁾ a famous English ecclesiastic, who was the first astronomical writer that acquired celebrity in the thirteenth century. Very nearly about the same time, appeared also that prodigy of genius and learning, Friar Bacon:⁽⁵²⁾ and from that period, down to our own day, there has been a succession of illustrious philosophers: whose names have justly been renowned, for the benefits they have conferred on mankind; names which reflect honour on the countries to which they respectively belong. Many of those benefactors of the world were honoured with marks of high distinction, by their sovereigns and cotemporaries; and their fame will descend to the latest posterity.

In recording these *Memoirs of the Life of an American Philosopher*, whose name adds dignity to the country that gave him birth, it is the design of the author to represent him as he truly was; and in doing so, he feels a conscious satisfaction, that his pen is employed in delineating the character of a man, who

(51) His name was *John Holywood*; deduced, according to a practice prevalent in his time, from the place of his nativity, which was Halifax, a town in the west-riding of Yorkshire, in England, where he was born in the year 1204. It was formerly named *Holy-wood*; and was, probably, so called in *Sacro-Bosco's* day: but the more ancient name of that place was Horton, or *Hair-town*; and Halifax signifies *Holy-hair*.—This great man was the inventor of the sphere; and wrote a work, entitled *De Sphæra*, which was very celebrated. He died at Paris, in 1256.

(52) He died in 1294, at the age of eighty years.

was rendered singularly eminent by his genius, his virtues and his public services. Deeply impressed with the magnitude and importance, as well as delicacy of the subject, the writer has not undertaken the task without some hesitation. He is sensible of the difficulties attending it, and conscious of his inability to do justice to its merits. Arduous, however, as the undertaking is, and since no abler pen has hitherto attempted any thing more, on this subject, than to eulogize⁽⁵³⁾ some of the prominent virtues and talents

(53) Dr. RUSH's *Eulogium*, "intended to perpetuate the memory of DAVID RITTENHOUSE," &c. was delivered before the American Philosophical Society in Philadelphia, (a great many public characters, and a numerous concourse of private citizens, also attending,) on the 17th of December 1796. It was pronounced in pursuance of an appointment made by the society, in these words, viz:

"At a meeting convened by special order, on the 1st of July, 1796, the following motion was made, and unanimously adopted; viz. That this Society, deeply affected by the death of their late worthy President, do resolve, That an EULOGIUM, commemorative of his distinguished talents and services, be publicly pronounced before the Society, by one of its members."—Dr. Rush's appointment was made at the next meeting of the society.

The following resolutions passed by them, after the delivery of the oration, will evince the high sense they entertained of the merit of this performance; viz.

"*Philosophical Hall, Dec. 17, 1796.—In Meeting of the American Philosophical Society,*

"*Resolved*, unanimously, That the thanks of this society be presented to Dr. Benjamin Rush, for the eloquent, learned, comprehensive, and just Eulogium, which he has this day pronounced, upon the character of our late respected President, Dr. David Rittenhouse.

of our philosopher, his present biographer will endeavour, by the fidelity with which he shall portray the character of that truly estimable man, to atone for the imperfections of the work in other respects. Possessing, as he does, some peculiar advantages, in relation to the materials necessary for this undertaking, he flatters himself it will be found, that he has been enabled thereby to exhibit to his countrymen, and the world generally, a portrait, which, in its more important features, may prove deserving of some share of public regard.

Sir William Forbes, in the introduction to his interesting Account of the Life and Writings of the late Dr. Beattie, reminds his readers, that "Mr. Mason prefaces his excellent and entertaining Memoirs of the Life and Writings of Gray, with an observation more remarkable for its truth than novelty; that "the Lives of men of letters seldom abound with inci-

"*Resolved*, unanimously, That Dr. Rush be requested to furnish the society with a copy of the Eulogium, to be published under their direction.

"An extract from the minutes:—SAMUEL MAGAW, ROBERT PATTERSON, W. BARTON, JOHN BLEARLEY, Secretaries."

It may not be thought superfluous, to add, that Dr. Rush well knew Mr. Rittenhouse. A personal friendship of an early date subsisted between them: it probably originated when the latter established his residence in Philadelphia, about six and twenty years before his death. In the summer of 1772, Mr. Rittenhouse (in a letter to the Rev. Mr. Barton) expressed his friendly estimation of the doctor in these few words—"The esteem I have for Dr. Rush is such, that his friendship for Mr. ***** would, alone, give me a very good opinion of that gentleman."

dents.”—“A reader of sense and taste, therefore,” continues Mr. Mason, “never expects to find, in the *Memoirs of a Philosopher or Poet*, the same species of entertainment or information, which he would receive from those of a Statesman or General. He expects, however, to be informed or entertained. Nor will he be disappointed, did the writer take care to dwell principally on such topics as characterize the man, and distinguish that peculiar part which he acted in the varied drama of society.”

Yet these observations of Mr. Gray's biographer, though pretty generally correct, admit of some qualification and many exceptions, depending on a variety of circumstances. It is true, that a mere narrative of the life of a “philosopher,” as well as of a “poet,” considered only as such, and abstractedly, must be expected to be devoid of much “incident” that can interest the generality of readers. But, both philosophers and poets have, in some instances, been also statesmen; sometimes, even generals: both have, not unfrequently, distinguished themselves as patriots, and benefactors of mankind.

In writing the life of our philosopher, the plan of a dry recital of only such circumstances and occurrences as have an immediate relation to the individual, has not been pursued. Biographical *Memoirs*, it is conceived, do not confine a writer to limits so narrow, but permit him to take a much greater latitude. It is

even allowable, in works of this kind, to introduce historical facts, memorable events, proceedings of public bodies, notices of eminent men, evidences of the progress and state of literature, science and the arts, and the actual condition of civil society, in the scene that is contemplated ; together with occasional reflections on those and similar subjects. Some of these objects may not seem, perhaps, to be necessarily or very intimately connected with the principal design, the life of the person treated of : but such of them as should, at first view, appear to have the most remote relation to that object, may be afterwards discovered to be both useful and interesting in a discussion of this nature ; while others serve to elucidate the main scope of the work. A latitude of this description, in the compilation of memoirs, seems to be quite consistent with the genius and spirit of works of that nature ; and the modern practice of memoir-writers has been conformable to this view of the subject.⁽⁵⁴⁾

(54) " Biography, or the writing of Lives," says Dr. Hugh Blair, " is a very useful kind of composition ; less formal and stately than history ; but to the bulk of readers, perhaps, no less instructive ; as it affords them the opportunity of seeing the characters and tempers, the virtues and failings of eminent men, fully displayed ; and admits them into a more thorough and intimate acquaintance with such persons, than history generally allows. For, a writer of lives may descend, with propriety, to minute circumstances and familiar incidents. It is expected of him, that he is to give the private, as well as public life, of the person whose actions he records ; nay, it is from private life, from familiar, domestic, and seemingly trivial occurrences, we often receive most light into the real character."—*Lectures on Rhetoric and Belles Lettres*, sect. 36.

The writer of the present work has therefore ventured, with all due deference to the public opinion, to

In addition to so respectable an opinion as that of Professor Blair, respecting the utility and characteristic features of biographical works, the writer of these memoirs hopes he will be excused for giving the sentiments on the same subject, contained in the following extracts from Dr. Maty's *Memoirs of the Life of Lord Chesterfield*, "tending to illustrate the civil, literary, and political history of his own time."

"Besides the great utility which general history derives from private authorities, other advantages no less important," says this learned and ingenious biographer, "may be obtained from them. It is from observing individuals, that we may be enabled to draw the outlines of that extraordinary, complicated being, man. The characteristics of any country or age must be deduced from the separate characters of persons, who, however distinguishable in many respects, still preserve a family-likeness. From the life of almost any one individual, but chiefly from the lives of such eminent men as seemed destined to enlighten or to adorn society, instructions may be drawn, suitable to every capacity, rank, age or station. Young men, aspiring to honours, cannot be too assiduous in tracing the means by which they were obtained: by observing with what difficulty they were preserved, they will be apprized of their real value, estimate the risks of the purchase, and discover frequent disappointment in the possession."

"It is from the number and variety of private memoirs, and the collision of opposite testimonies, that the judicious reader is enabled to strike out light, and find his way through that darkness and confusion in which he is at first involved."

"Who does not wish that Cæsar had lived to finish his Commentaries; and that Pompey's sons, instead of fighting their father's cause, had employed themselves in writing his life?—What a valuable legacy would Cicero have left us, if, instead of his philosophical works, he had written the memoirs of his own times! Or how much would Tyro, to whom posterity is so much indebted for the preservation of his master's letters, have increased that obligation, if, from his own knowledge, he had con-

pursue the course here described. And in doing this, he presumes that the comprehensive range he has allowed himself has enabled him to render his memoirs, even of a "philosopher," not altogether barren of incidents, nor destitute, he trusts, either of pleasing information or useful instruction.

nected and explained them! The life of Agricola, by his son-in-law Tacitus, is undoubtedly one of the most precious monuments of antiquity."

NOTE.—The reader is requested to substitute (with his pen) the word *Earth*, in the place of "Sun," in the sixth line of the note numbered (18), page xxxii. of the foregoing Introduction: the error in the print is an essential one; and passed unobserved, until it was too late to correct it in the press. At the same time the reader will be pleased to insert the word *scarcely*, in the place of "scarcity," in the ninth line from the top of page xlii.

MEMOIRS
OF THE
LIFE OF DAVID RITTENHOUSE;
ANTERIOR TO
HIS SETTLEMENT IN PHILADELPHIA.

THE paternal ancestors of **DAVID RITTENHOUSE** were early and long seated at Arnheim, a fortified city on the Rhine, and capital of the district of Velewe or Veluive, sometimes called the Velau, in the Batavian province of Guelderland ;⁽¹⁾ where, it is said, they

(1) The duchy of Guelderland formerly belonged to the Spanish monarchy ; but by the peace of Utrecht, in 1713, part of it was ceded to Austria, part to Prussia, and guaranteed to them by the treaty of Baden, in 1714 : that part which became subject to Prussia was, in exchange for the principality of Orange, ceded to France. By the barrier-treaty, in 1715, the states general of the United Provinces likewise obtained a part of it. But the Upper and Lower Guelderland have no connexion with each other : Lower Guelderland is (or was, until very lately) one of the Seven United Provinces : it is the largest of them all, and the first in rank. Arnheim, which is the capital of the whole pro-

conducted manufactories of paper,⁶⁹ during the course of some generations. The orthography of the name

vince, is a large, populous, and handsome town: it was formerly the residence of the dukes of Guelderland, and the states of the province held their meetings there.

(2) The writer of these memoirs having been in Holland in the summer of the year 1778, adverted, while in Amsterdam, to the circumstance of the Rittenhouses, of Pennsylvania, having come into America from some part of the United Provinces; and his curiosity being excited, by his consanguineous connexion with that family, to obtain some information concerning them, the following was the result of his enquiries. He found a Mr. *Adrian Rittinghuysen*, (for so he himself wrote his name,) residing in that city. This venerable man, who was then eighty-five years of age, appeared to be at least independent in his condition; and had, probably, retired from business, the part of the city in which he resided (the Egelantier's Gracht, or Canal,) not exhibiting the appearance of a street of trade.

The information derived from this respectable old man, was, that his forefathers had long been established at Arnheim; that his father, Nicholas, was a paper-manufacturer in that city, as others of the family had been; and that his father's brother, William, went with his family to North America, where he some time afterward, as he had understood, established the paper-mills near Germantown. He further stated, that he had only one child, a daughter, who was married, and resided at the Hague; and that he was, himself, as he believed, the last of his family-name, remaining in the United Provinces.

Although plain in his dress and manners, and in the general appearance of his household, this person seemed to be pleased in shewing the writer a family-seal, on which was engraved a coat of arms. The armorial device represented a castellated house, or chateau; on the left side of which was a horse, standing on his hind feet and rearing up, with his fore feet resting against the wall of the house: and this house very much resembled the chateau in the armorial bearing of the Spanish family "*de Fuentes, señores del Castillo*," as represented in Dubuisson's French

was formerly Rittinghuysen, as the writer of these memoirs was informed by an European member of this fa-

Collection of Arms: The seal having been much worn, the lines, &c. describing the several tinctures of the bearing, could not be discerned; and, therefore, it cannot be properly blazoned. At the same time, the old gentleman did not omit to mention, that his mother was a *De Ruyter*; and that her arms were, a mounted chevalier armed cap-à-piè

These facts, relative to the origin of the American Rittenhouses, did not appear to the writer to be unworthy of notice. They are correctly stated, being taken from a memorandum made by him, immediately after his interview with Adrian Rittinghuysen.

The introduction of this slight sketch of the occupation and condition of some of the European ancestors of our Philosopher, into his Life, may be the more readily excused, since the great Newton himself was not inattentive to such objects. There is, indeed, implanted by nature in the human mind, a strong desire to become acquainted with the family-history of our forefathers. Hence, Sir Isaac Newton left, in his own hand-writing, a genealogical account or pedigree of his family; with directions, subjoined thereto, that the registers of certain parishes should be searched, from the beginning to the year 1650; and he adds—"Let the extracts be taken, by copying out of the registers whatever may be met with, about the family of the Newtons, in words at length, without omitting any of the words." This investigation and enquiry of Sir Isaac, was made in the sixty-third year of his age; and he himself caused the result to be entered in the books of the herald's office.

Such, also, was the curiosity of Dr. Benjamin Franklin. While the Doctor was in England, he undertook a journey to Eaton, in Northamptonshire, (a village situated between Wellingborough and Northampton,) the residence of his forefathers, for the purpose of obtaining information, as he tells us himself, concerning his family.—"To be acquainted with the particulars of my parentage and life, many of which are unknown to you," (said Dr. Franklin in his *Life*, which he addressed to his son,) "I flatter myself, will afford the same pleasure to you as to me—I shall relate them upon paper."

mily.⁽³⁾ But it is not improbable, that, in more strict conformity to the idiom of its Saxo-Germanic original, the name was spelt Ritterhuysen⁽⁴⁾—or, perhaps, Ritterhausen; which signifies, in our language, *Knights' Houses*: a conjecture that seems to be somewhat corroborated by the chivalrous emblems alluding to this name, belonging to the family, and which have been already noticed.

It has been asserted, that the first of the Rittenhouses who migrated to America, was named William; and that he went from Guelderland to the (now) state of New-York, while it was yet a Dutch colony. This William was also said to have left at Arnheim a brother, Nicholas, who continued to carry on the paper-making business in that city.⁽⁵⁾ But, in a ge-

(3) See the preceding note.

(4) Conradus Rittershusius was a learned civilian of Germany. He was born at Brunswick in the year 1560, and died at Altorf in Switzerland, in 1613. Two of his sons, George and Nicholas, also distinguished themselves in the republic of letters. The writer of the present memoirs is too little acquainted with the genealogies of either German or Dutch families, to pretend to claim any consanguinity between this C. Rittershuysen (or, as latinized, Rittershusius,) and our Rittenhouses. But the name appears to have been, originally, the same; and the ancestors of both, it may be presumed, were of the same country: In giving a latin termination to the name, the *y* is omitted, not being a Roman letter.

(5) The Dutch were early and long distinguished for the superior quality of the paper manufactured in their country. It excelled, in its whiteness and the closeness of its texture, as well as its goodness in other respects, the paper made elsewhere;

nealogical account of the family in the possession of the Memorialist, Garrett (or Gerard) and Nicholas

and it was an article of great importance to the republic, both for the internal consumption and for exportation, until the Hollanders were rivalled in this manufacture by the perfection to which it was afterwards brought in other parts of Europe.

Paper, made from linen rags (for that made from cotton, silk, and some other substances, was of a much elder date,) is said to have been originally introduced into Germany from Valencia and Catalonia, in Spain, as early as the year 1312, and to have appeared in England eight or ten years afterwards. But the first paper-mill in Great Britain was erected at Dartford in Kent, by Mr. Speelman, a German, jeweller to queen Elizabeth, in the year 1558: and it was not until more than a century after, that any other paper than of an inferior quality was manufactured in England. Little besides brown paper was made there, prior to the revolution in 1688: yet, soon after that period, the English were enabled to supply themselves with much the greater part of the various kinds of paper used in their country, from their own mills; and the perfection to which the manufacture of this important article has since been carried, not only in England, but in France, Italy and Germany, has greatly diminished the consumption of Dutch paper.

It is a fact worthy of notice, that the establishment of paper-mills in Pennsylvania, by the Rittenhouses, was nearly co-eval with the general introduction of the manufactory of white paper in the mother country. This appears from the following circumstance:—There is now before the writer of these memoirs a paper in the hand-writing of the celebrated William Penn, and subscribed with his name, certifying that “William Rittinghousen and Claus” (Nicholas) “his son,” then “part owners of the paper-mill near Germantown,” had recently sustained a very great loss by a violent and sudden flood, which carried away the said mill, with a considerable quantity of paper, materials and tools, with other things therein, whereby they were reduced to great distress; and, therefore, recommending to such persons as should be disposed to lend them aid, to give the sufferers “relief and encouragement, in their needful and commendable employ-

Rittenhouse are stated to have arrived at New-York, from Holland, so late as the year 1690 : it likewise states, that Nicholas there married Wilhelmina Dewees, a sister of William Dewees, who came thither about the same time ; and that, soon afterwards, they all removed to the neighbourhood of Germantown in Pennsylvania ; where Nicholas established the first

ment," as they were "desirous to set up the paper-mill again."— This certificate is without date : but Mr. Penn was twice in Pennsylvania. He first arrived in the year 1682, and returned to England in 1684 ; his second arrival was in 1699, and he finally left the province in 1701. It was probably during the latter period of his residence in his proprietary-dominion, though, perhaps, in the first, that the Germantown paper-mills were destroyed.

The William Rittinghousen (so Mr. Penn writes the name) here mentioned, is supposed to be the same named in the text, and to have been the great-grandfather of our astronomer. In Mr. Penn's certificate he is called an old man, and is stated to have then been "decrepid."

In order to shew the present importance of that article, as a manufacture, in the United States, and which was first fabricated in this country by the Rittenhouses, the reader is presented with the following view of the quantity of paper, of various descriptions, annually made at one hundred and eighty-five paper-mills, within the United States ; taken from the latest information furnished on this subject.

	Tons.	Reams.	Value.
For Newspapers,* . . .	500 . .	50,000 . .	\$150,000
Books,	630 . .	70,000 . .	245,000
Writing,	650 . .	111,000 . .	333,000
Wrapping,	800 . .	100,000 . .	83,000
	<hr/> 2580	<hr/> 331,000	<hr/> 811,000

* The number of Newspapers, printed annually in the United States, is estimated at twenty-two and an half millions.

paper-mill ever erected in America.⁽⁶⁾ It is believed, however, that Garrett and Nicholas Rittenhouse were sons of William; who is supposed to have arrived in some part of the original territories of New-York, prior to the year 1674;⁽⁷⁾ that the Nicholas left in Arnheim, was his brother; and that his sons Garrett and Nicholas, who are stated to have been the first of the family that settled in New-York, in 1690 (from whence they removed, "soon afterwards," into Pennsylvania,) did, in fact, transfer themselves into this latter province, in that year.—Garrett left children; some of whose descendants are resident in Pennsylvania, and others in New-Jersey.

Nicholas Rittenhouse, the grandfather of our Philosopher, died about the year 1730; leaving three

(6) Mr. Benjamin Rittenhouse, a younger brother of David, speaking of his paternal ancestors, in a letter addressed to the writer of these memoirs, says: "The family originally settled in the state of New-York, while a Dutch colony; and were, undoubtedly, the first paper-makers in America." This fact was also communicated to the writer, by Dr. Franklin, some years before.

(7) At the peace of Breda, in 1667, the Dutch colony of New Netherlands was confirmed to the English, to whom it had been ceded in 1664. But the Dutch having reduced the country in the years 1672 and 1673, it was finally restored to the English by the peace of Westminster, on the 9th of February, 1674. The Rittenhouses are supposed to have seated themselves, before this latter period, in that part of the colony afterwards called East-Jersey. Some of the name reside in the state of New-Jersey, at this day; but it is not known that any of them are inhabitants of the state of New-York. Those in New-Jersey, with most of those of the name in Pennsylvania, are descendants of Nicholas.

sons, William, Henry, and Matthias; and four daughters, Psyche, Mary, Catharine, and Susanna. Of these daughters, Psyche intermarried with John Gorgas, from whom are descended the Gorgas's of Cresham and Cocolico; Mary, with John Johnson, the father of Casper, John, Nicholas, William, and Benjamin Johnson, some of whom are now (or were lately) living, in the neighbourhood of Germantown; Catharine, with Jacob Engle, in the same vicinity; and Susanna, with Henry Heiley of Goshehoppem.

William Rittenhouse, the eldest brother of our Philosopher's father, died at the paper-mills, near Germantown. He left several children, one of whom did lately, and perhaps yet does, carry on those works.— Henry and Matthias removed to the townships of Worcester and Norriton, about the year 1732 or 1733; where both lived to be upwards of seventy years of age.

The old American stock of the Rittenhouses were Anabaptists,⁽⁸⁾ and persons of very considerable note

(8) The Rittenhouses who first settled in America, are supposed to have leaned towards the religious tenets of (if they did not belong to) that peaceable branch of the Anabaptists, denominated Mennonites. Simon Menno, the founder of this sect, was one of the first reformers: he was born at a village called Witmarsum, in the Batavian province of Friesland, in 1505; the same year in which John Knox was born, and four years before the birth of Calvin.

Menno had been a priest of the Roman Catholic Church, and some have endeavoured to stigmatize him, as one who was "a no-

In that religious society. Probably, therefore, they were induced to establish their residence in Pennsylvania, towards the close of the seventeenth century, by the tolerating principles held forth by William Penn,⁽⁹⁾

torious 1 rofligate." This, however, may be attributed to his having left the communion of the church of which he was originally a member: for, he is represented to have been "a man of probity, of a meek and tractable spirit, gentle in his manners, pliable and obsequious in his commerce with persons of all ranks and characters, and extremely zealous in promoting practical religion and virtue, which he recommended by his example as well as by his precepts." He was, moreover, a man of genius and eloquence, and possessed a considerable share of learning. This extraordinary man died in the duchy of Holstein, in the year 1561.

The fundamental principles of the followers of Menno are, in some respects, similar to those of the people called Quakers: They use, likewise, great plainness in their apparel, and adhere to some of the practices of the primitive Christian church. But this peaceable sect baptize adults, and celebrate the eucharist in a manner peculiar to themselves.

Some of Menno's disciples came into Pennsylvania from New-York, in the year 1692. The principal congregation of this sect was established at Germantown, soon after the Rittenhouses had settled themselves there; and this may be considered as the mother of the sect, in America. The Mennonites have since become a numerous body in Pennsylvania, principally in the county of Lancaster; and this religious society comprehends, among its members, many intelligent worthy men, and valuable citizens.

(9) In the Preface to a printed copy of the celebrated Speech delivered in the House of Assembly of Pennsylvania, on the 24th of May, 1764, by the late John Dickinson, Esq. the Merits of the Founder of Pennsylvania, as they were declared at various times, in the proceedings of the Legislative Body of the colony, and in some other public Documents, are thus summed up by the writer.

in respect to religious⁽¹⁰⁾ concerns; the justness of the tenure by which he became proprietor of the

“WILLIAM PENN,
 A Man of Principles truly humane,
 An Advocate for
 Religion and Liberty;
 Possessing a noble Spirit,
 That exerted itself
 For the Good of Mankind;
 was
 The great and worthy Founder
 of
 PENNSYLVANIA.
 To its Inhabitants, by Charter,
 He granted and confirmed
 Many singular Privileges and Immunities,
 Civil and Religious,
 Which he continually studied
 To preserve and defend for them;
 Nobly declaring,
 That they had not followed him so far,
 To lose a single tittle
 Of the Great Charter,
 To which all Englishmen were born.
 For these Services,
 Great have been the Acknowledgements
 Deservedly paid to his Merit;
 And his Memory
 Is dear to his People,
 Who have repeatedly confessed,
 That,
 Next to Divine Providence,
 Their Happiness, Prosperity, and Increase
 Are owing
 To his wise Conduct and singular Goodness;
 Which deserve ever to be remembered
 With
 Gratitude and Affection,
 By
 PENNSYLVANIANS.”

soil ;¹⁰ and the excellence of the political regulations established by that great legislator, for the civil government of his newly-acquired domains.

For the materials of which the foregoing Eulogy is composed, its author* has referred his readers to the Minutes of Assembly, for the years 1719 and 1725, to those from the year 1730 to 1740, both inclusive, excepting only 1736, 1737 and 1739; also, for 1745, 1755 and 1756; to other proceedings of the assembly, in the years 1730 and 1738; and to their Address to Governor John Penn, in 1764.

A very respectable Memorial of another nature, in honour of the justly celebrated Penn, decorates the edifice of a noble public institution in the capital of his former domain; an institution devoted to the purposes of charity, humanity and benevolence. It is a finely executed metallic statue, in bronze, of that great man; representing him in his appropriate attire, and holding in his right hand *The Charter of Privileges*.† The statue stands on an elegant pedestal of marble, in an handsome area on the south front of the Pennsylvania Hospital: and the four sides of the pedestal contain these modest inscriptions; viz.

“ William Penn—Born, 1644—Died, 1718.”

(And underneath, the Family-Arms, with his Motto; viz.)

“ Mercy—Justice.”

—
“ Pennsylvania Granted by Charles II. to William Penn,
1681.”

—
“ The Proprietary arrived in 1682; made a just and amicable arrangement with the Natives, for the purchase of their Lands; and went back to England in 1684.”

—
“ Returned to Pennsylvania, 1699; and finally withdrew to his Paternal Estate, 1701.”

* In the continuation of the *Life of Dr. Franklin*, (written by the late Dr. Stuber, of Philadelphia,) it is said that the Preface to Mr. Dickinson's Speech was drawn up by the late learned Provost Smith, and that Dr. Franklin wrote the Preface to Mr. Galloway's, in reply.

† See Note 10.

Matthias, the youngest son of Nicholas Rittenhouse, by Wilhelmina Dewees his wife, was born at

The public in general, with the Pennsylvania Hospital more particularly, are indebted for this Memorial of true Greatness, to the munificence of a Grandson of the Founder of the extensive Dominion that bears his name; John Penn, of Stoke-Poges in Buckinghamshire, Esquire; by whom the statue was presented, in the year 1804.

(10) The Charter of Privileges, granted and solemnly confirmed to the freemen of Pennsylvania and territories belonging to the province, by the proprietary, on the 28th of October, 1701, was, after being approved and agreed to by the legislative body of the province, accepted by them the same day; in lieu of the Frame of Government originally stipulated between Mr. Penn and the Planters, in the year 1683. The first article of this charter provided for a full enjoyment of the Liberty of Conscience, by all persons who should acknowledge "One Almighty God, the Creator, Upholder, and Ruler of the World." It also declared to be capable of holding any office or place, under the government, all persons professing faith in "Jesus Christ, the Saviour of the World," and who should, when required, attest their allegiance, &c.

(11) Incorporated with that edition of the *Laws of Pennsylvania*, which was published in the year 1810, "under the authority of the legislature," with Notes and References, by Charles Smith, Esq. is an article that bears a respectful testimony to the justice and clemency of the founder of that state: It is an important and very interesting *Note* to an act of assembly passed the 1st day of April, 1784, (entitled, "An act for opening the Land-Office, for granting and disposing of the unappropriated Lands within this State,") containing "a connected view of the land-titles of Pennsylvania from its first settlement to the present time." In this document the learned editor speaks of the integrity and virtuous policy manifested by Penn, with respect to his conduct towards the Indian natives of the country, to which he had acquired the dominion under his sovereign, in these terms.

the paper-mills belonging to his family, near Germantown,⁽¹²⁾ in the county of Philadelphia and about eight miles from the capital of Pennsylvania, in the year 1700. Having abandoned the occupation of a paper-maker, when about twenty-nine years of age, and two years after his father's death, he then commenced the business of a farmer, on a piece of land he had purchased in the township of Norriston,⁽¹³⁾ about twenty

"William Penn, although clothed with powers as full and comprehensive as those possessed by the adventurers from Portugal and Spain, was influenced by a purer morality and sounder solicy. His religious principles did not permit him to wrest the soil, by force, from the people to whom God and nature gave it, nor to establish his title in blood; but, under the shade of the lofty trees of the forest, his right was fixed by treaties with the natives, and sanctified, as it were, by incense smoking from the calumet of peace."

The note from which this extract is made, (and which comprises 156 large 8vo. pages, printed on a small type,) forms a valuable treatise, historical as well as legal, of the territorial rights of the former proprietaries, and of the land-titles deduced from them by the citizens of Pennsylvania.

(12) Germantown was settled in the year 1682. It was so called by its founders, a small colony of Germans from the Palatinate, mostly from the vicinity of the city of Worms, who are said to have been converted while in their own country, to the principles of the people called Quakers, by the preaching of William Ames, an Englishman. Germantown is now a populous village, of considerable extent; and by reason of its proximity to the capital, this place furnishes an agreeable residence to many respectable families from thence. See also Note 8.

(13) This township derives its name (which it gave also to Mr. Rittenhouse's patrimonial farm and his original observatory,) as does likewise the neighbouring town of Norriston, the county-

miles from the city of Philadelphia; his brother Henry establishing himself in the same manner, in the adjoining township of Worcester. In October, 1787,—about three years prior to Matthias's removal from the vicinity of Germantown,—he had become a married man. His wife was Elizabeth William (or Williams) who was born in 1704, and was daughter of Evan William, a native of Wales. Her father, a farmer, dying while she was a child, she was placed under the charge of an elderly English (or, more probably, Welsh) gentleman, in the neighbourhood, of the name of Richard Jones; a relation of her family. That truly respectable woman possessed a cheerful temper, with a mind uncommonly vigorous and comprehensive: but her education was much neglected, as is too often the fate of orphan children. Yet, perhaps, no censure ought justly to be imputable to Mr. Jones, in this case; because there were very few schools of any kind, in country situations, at that early day.⁽¹⁴⁾

town of the (now) county of Montgomery, from the respectable Pennsylvania family of Norris; of which Isaac Norris, Esq. was eighteen times chosen Speaker of the General Assembly of Pennsylvania, during the term of half a century from the time of his first election, in the year 1713. Mr. Norris held many public offices in Pennsylvania with great reputation and honour. He is represented as having been "an ornament to his country;" and this gentleman, who died in the year 1735, then held the Chief-Justiceship of the Province.

(14) In the year 1683, Enoch Flower undertook to teach English in the town of Philadelphia. Six years afterwards, originated

The extraordinary natural understanding of this person, so very nearly related as she was to the subject of these memoirs, seemed to the writer to merit particular notice; and the more especially, for a reason which shall be hereafter mentioned.

By this wife, Matthias Rittenhouse had four sons and six daughters; ⁽¹⁵⁾ three of whom died in their mi-

the Friends' Public School in the same town, then in its infancy; and in 1697, this school was incorporated, on the petition of Samuel Carpenter, Edward Shippen, Anthony Morris, James Fox, David Lloyd, William Southby, and John Jones, in behalf of themselves and others. In the year 1708, this corporation was enlarged and perpetuated by a new charter, under the name of "The Overseers of the Public School, founded in Philadelphia, at the request, cost, and charges of the people called Quakers." It was further extended in the year 1711; when the three first named gentlemen, together with Griffith Owen, Thomas Story, Richard Hill, Isaac Norris, Samuel Preston, Jonathan Dickinson, Nathan Stanbury, Thomas Masters, Nicholas Waln, Caleb Pusey, Rowland Ellis and James Logan, were appointed Overseers.

As this was the earliest considerable school established in Pennsylvania, as well as the first institution of the kind, in the province, the names of its promoters deserve to be held in remembrance, among the patrons of learning and useful knowledge in this country.

From this view of the origin of schools in the capital of Pennsylvania, it will be perceived, that the means of acquiring even the rudiments of literary instruction must have been difficult of access in country places, for some considerable time after the ~~periods~~ just mentioned. This is one of the most serious grievances to which the settlers in new and unimproved countries are subjected.

(15) Margaret, who intermarried with Edward Morgan; Esther, with the Rev. Thomas Barton; David, the subject of these Me-

minority. The three eldest of the children were born at the place of their father's nativity; the others, at Norriton. Of the former number was DAVID, the eldest son, the subject of these memoirs.—He was born on the 8th day of April, 1722.⁽¹⁶⁾

moirs; Andrew, who died in his minority; Anne, who intermarried with George Shoemaker; Eleanor, who intermarried with Daniel Evans; Benjamin, yet living; Jonathan, who died in his minority; and Mary and Elizabeth (twins,) of whom the latter died in her minority, unmarried: Mary, who is living, has been twice married, but without issue; her first husband was Thomas Morgan. David had no sons; and two of his three brothers having died young and unmarried, the only persons, descended from our philosopher's father, Matthias, who now bear the name of Rittenhouse, are the surviving brother of David, namely, Benjamin, and his sons. Benjamin has been twice married; first, to a daughter of General John Bull; and, secondly, to a daughter of Colonel Francis Wade: By both marriages he has male issue; and, as it is believed, two of the sons by the first wife are married.

(16) "There is," says a late ingenious writer,* "a strong propensity in the human mind to trace up our ancestry to as high and as remote a source as possible." "This principle of our nature," he observes, "although liable to great perversion, and frequently the source of well-founded ridicule, may, if rightly directed, become the parent of great actions. The origin and progress of individuals, of families, and of nations, constitute Biography and History, two of the most interesting departments of human knowledge."

The pride of ancestry is, indeed, "liable to great perversion," and is too frequently "the source of well-founded ridicule;" yet the experience and the history of mankind, in every age and

* See a "Discourse delivered before the New-York Historical Society, at their anniversary meeting, December the 6th, 1811: By the Hon. De Witt Clinton, one of the Vice-Presidents of the Society."

This son was an infant, when his family removed to Newsiton and engaged in the business of farming; and his father appears, early, to have designed him for this most useful and very respectable employment. Accordingly, as soon as the boy arrived at a sufficient age to assist in conducting the affairs of the farm, he was occupied as an husbandman. This kind of occupation seems to have commenced at a very early period of his life; for it is ascertained, that, about the fourteenth year of his age, he was actually employed in ploughing his father's fields.⁽¹⁷⁾

country, have shewn, that it is connected with and derived from principles of our nature, which are not only laudable in themselves, but such as, if "rightly directed" and properly applied, become eminently useful to society.

(17) It is not this occupation that, in itself, usually attaches to those who follow it, the idea of clownishness: but it is the ignorance that, unfortunately, too generally characterizes persons employed in it, which, by an association of ideas, is apt to derogate from the worthiness of the employment itself. If the profession of husbandry be an honourable one, and every rational consideration renders it such, then one of the most important operations in conducting the great business of the agriculturist, cannot be destitute of dignity. To follow the plough is not a servile labour: it is an employment worthy of a freeman; and if the person, thus engaged, be a man of native talents, aided by some improvement of mind, scarcely any occupation can afford him greater scope for philosophic reflection.

While, therefore, the reader contemplates the celebrated Rittenhouse, such as he was in his maturer years; and then takes a retrospective view of the embryo-philosopher in the period of his youth, directing the plough on his father's freehold; let it be recollected, that the sovereigns of a mighty empire, in the Eastern world, occasionally guide this truly important machine with

At that period of our future Philosopher's life, early as it was, his uncultivated mind, naturally teeming with the most prolific germs of yet unexpanded science, began to unfold those buds of genius, which soon after attained that wonderful luxuriance of growth by which the usefulness and splendour of his talents became eminently conspicuous. His brother Benjamin relates,⁽¹⁸⁾ that, while David was thus employed at the plough, from the age of fourteen years and for some time after, he (this informant,) then a young boy, was frequently sent to call him to his

their own hands, in honour of agriculture: let him recal to his mind, that, in the proudest days of the Roman republic, consuls, dictators, senators, and generals, were not unfrequently called forth from the actual occupancy of this implement of husbandry, by the voice of their country; and, seizing either the civil or the military helm of its government, with hands indurated by the toils of the peaceful field, have by the wisdom of their counsel, or by their valour, supported the tottering fabric of the state and saved the commonwealth: let them remember, in fine, that—

“In ancient times, the sacred plough employ'd
The kings and awful fathers of mankind;”*

and that WASHINGTON, himself, the pride and boast of his age as well as country, disdained not to engage himself, personally, in agricultural pursuits.

(18) This gentleman was commissioned by Governor Mifflin, in the year 1791, to be one of the associate judges of the court of common pleas, in and for the county of Montgomery: but his tenure of this office was afterwards vacated, by his removal to Philadelphia.

* Thomson's Spring.

fields ; at which times he repeatedly observed, that not only the fences at the head of many of the furrows, but even his plough and its handles, were covered over with chalked numerical figures, &c.⁽¹⁹⁾—Hence it is evident, that the exuberance of a sublime native genius and of almost unbounded intellectual powers, unaided by any artificial means of excitement, were enabled, by dint of their own energy, to burst through those restraints which the corporeal employments of his youth necessarily imposed upon them.

During that portion of his life in which this youthful philosopher pursued the ordinary occupations of a husbandman, which continued until about the eighteenth year of his age, as well as in his earlier youth, he appeared to have inherited from healthful parents a sound constitution, and to have enjoyed good health.

It was at this period, or rather about the seventeenth year of his age, that he made a wooden clock, of very ingenious workmanship : and soon after, he constructed one of the same materials that compose the common four-and-twenty hour clock, and upon the same principles. But he had exhibited much earlier proofs of his mechanical genius, by making, when

(19) "Astronomy," says Mr. B. Rittenhouse, in the letter before referred to, "appeared at a very early day to be his favourite study ; but he also applied himself industriously to the study of opticks, the mechanical powers," &c.

only seven or eight years old, a complete water-mill in miniature.

Mr. Rittenhouse's father was a very respectable man: he possessed a good understanding, united to a most benevolent heart and great simplicity of manners. The writer long knew him; and, from his early acquaintance with the character, the appearance, and the habits of this worthy sire of an illustrious son, he had long supposed him to have been inclined to the religious principles of the society called Friends, although he had been bred a Baptist:—but a circumstance which shall be noticed hereafter, will evince the liberality of this good man's opinions, in the all-important concern of religion. Yet, with truly estimable qualities, both of the head and heart, old Mr. Rittenhouse had no claims to what is termed genius; and therefore did not, probably, duly appreciate the early specimens of that talent, which appeared so conspicuous in his son David. Hence, he was for some time opposed to the young man's earnest desire to renounce agricultural employments; for the purpose of devoting himself, altogether, to philosophical pursuits, in connexion with some such mechanical profession as might best comport with useful objects of natural philosophy, and be most likely, at the same time, to afford him the means of a comfortable subsistence. At length, however, the father yielded his own inclinations, in order to gratify what was manifestly the irresistible impulse of his son's genius: he supplied him

with money to purchase, in Philadelphia, such tools as were more immediately necessary for commencing the clock-making business, which the son then adopted as his profession.

About the same time, young Mr. Rittenhouse erected on the side of a public road, and on his father's land in the township of Norriton, a small but commodious work-shop; and, after having made many implements of the trade with his own hands, to supply the deficiency of many such as were wanting in his purchased stock, he set out in good earnest as a clock and mathematical instrument maker.

From the age of eighteen or nineteen to twenty-five, Mr. Rittenhouse applied himself unremittingly, both to his trade and his studies. Employed throughout the day in his attention to the former, he devoted much of his nights to the latter. Indeed he deprived himself of the necessary hours of rest; for it was his almost invariable practice to sit up, at his books, until midnight, sometimes much later.

It was in this interval and by these means, that our young philosopher impaired his constitution, and contracted a pain in his breast; or rather, as he himself described that malady to the writer, "a constant heat in the pit of the stomach, affecting a space not exceeding the size of half a guinea, attended at times with much pain;" a sensation from which he was

never exempt, during the remainder of his life. About this time, he retired from all business, and passed several weeks at the Yellow Springs, distant but a few miles from his place of residence. He there bathed and drank the waters; and from the use of this chalybeate, he appeared to have derived some benefit to his general health, though it afforded little alleviation of the pain in his breast.

A due regard to the sacredness of historic truth demands, that some circumstances which occurred while Mr. Rittenhouse was yet a youth, and *one* which it is believed had a very considerable influence on his subsequent pursuits and reputation, should now be made known. Because the writer of these memoirs conceives he ought not to be restrained, by motives which would appear to him to arise from a mistaken delicacy, from introducing into his work such notices of his own father, long since deceased, as do justice to his memory; while they also serve to elucidate the biographical history of Mr. Rittenhouse.

In the year 1751, when David Rittenhouse was about nineteen years of age, THOMAS BARTON, who was two years elder than David, opened a school in the neighbourhood of Mr. Matthias Rittenhouse. It was while Mr. Barton continued in that place, supposed to have been about a year and a half, that he became acquainted with the Rittenhouse Family; an acquaintance which soon ripened into a warm friendship

for young Mr. Rittenhouse, and a more tender attachment to his sister, Esther.

Two years afterwards (in 1753), the personal attractions and fine understanding of the sister rendered her the wife of Mr. Barton; who, for some time before, had officiated as one of the tutors in the then recently-established Academy, afterwards College, of Philadelphia; now the University of Pennsylvania. In this station, he continued until the autumn of 1754; when he embarked for England, for the purpose of receiving episcopal ordination in the church, and returned to Pennsylvania in the early part of the following year.

The very intimate connexion thus formed between Mr. Barton and a sister of Mr. Rittenhouse (who was two years elder than this brother), strengthened the bands of friendship which had so early united these young men: a friendship affectionate and sincere, and one which never ceased until Mr. Barton's death, nearly thirty years afterwards; notwithstanding some difference of political opinions had arisen between these brothers-in-law, in the latter part of that period, in consequence of the declaration of the American independence.

Mr. Barton was a native of Ireland, descended from an English family; of which, either two or three brothers settled in that kingdom, during the disastrous times in

the interregnum of Charles I. Having obtained very considerable grants of land in Ireland, this family possessed ample estates in their then adopted country. Hence, flattering prospects of an establishment there, in respect to fortune, were held out to their descendants. Through one of those untoward circumstances, however, by means of which the most unexpected revolutions in the affairs of families and individuals have been sometimes produced, the expectations of an independent patrimony which our Mr. Barton's father had entertained, were speedily dissipated. Nevertheless, this gentleman, who was the eldest son of his family, was instructed in the rudiments of a classical education in the vicinity of his family residence in the county of Monaghan, under the direction of the Rev. Mr. Folds, a respectable English clergyman; and at a suitable age, he was sent to the university of Dublin, where he finished his academical education. Entirely destitute of fortune, but possessing a strong intellect, stored with useful and ornamental learning as well as an ardent and enterprising spirit, this young adventurer arrived in Philadelphia soon after he had completed his scholastic studies.

The writer's principal design, in presenting to the public view these slight sketches of the early history of the late Rev. Mr. Barton, shall be now explained.

When Mr. Rittenhouse's father established his residence at Norriton, and during the minority of the

son, there were no schools in the vicinity at which any thing more was taught, than reading and writing in the English language and the simplest rules of arithmetic. Young Mr. Rittenhouse's school-education, in his early youth, was therefore necessarily bounded by these scanty limits of accessible instruction : He was, in truth, *taught* nothing beyond these very circumscribed bounds of literary knowledge, prior to the nineteenth year of his age ; though it is certain, that some years before that period of his life, he began to be known—at least in his own neighbourhood—as a mathematician and astronomer, in consequence of *his* cultivation of the transcendent genius with which heaven had endued him.

Under such circumstances as these, the familiar intercourse between David Rittenhouse and his young friend Barton, which commenced when the age of the former did not exceed nineteen years, could not fail to prove highly advantageous to the mental improvement of both. The one possessed a sublime native genius ; which, however, was yet but very imperfectly cultivated, for want of the indispensable means of extending the bounds of natural knowledge : the other had enjoyed the use of those means, in an eminent degree, and thus justly acquired the reputation of a man of learning. A reciprocation of these different advantages, as may be well supposed, greatly promoted the intellectual improvement of both.

It will be readily conceived, that Mr. Barton's knowledge of books must have rendered even his conversation instructive to Mr. Rittenhouse, at so early a period of his life. But the former so greatly admired the natural powers of his young friend's mind, that he took a delight in obtaining for him access to such philosophical works, and other useful books, as he was then enabled to procure for his use; besides directing, as far as he was capable, the course of his studies.

After Mr. Barton's removal to Philadelphia and while he resided in that city, his means of furnishing his friend with books, suitable for his instruction, were greatly enlarged; an advantage of which he most assiduously availed himself: and it is supposed to have been about this time, that a small circulating library was established in Norriton, at the instance of Mr. Barton, zealously seconded by the co-operation and influence of Mr. Rittenhouse.

Finally, when Mr. Barton returned from England, in the year 1755—at which time Mr. Rittenhouse was yet but twenty-three years of age, he brought with him a valuable addition to his friends's little library; consisting, in part, of books which he himself had commissioned Mr. Barton to purchase for him.⁽²⁰⁾

(20) The zeal and attention with which our young philosopher pursued his early studies, and such mechanical objects as are more intimately connected with those branches of natural philosophy to which he was most devoted, will appear from the

No doubt can be entertained, that Mr. Rittenhouse derived the great and extraordinary faculties of his mind from nature; and it is equally evident, that for some years after he arrived to manhood, he possessed very slender means of improving his natural talents : Nay further, it is well known to those who were long personally acquainted with him, that after his removal to Philadelphia, when he was eight-and-thirty years of age, a period of life at which the place of his residence, and the condition of his pecuniary affairs, united in placing within his reach much that is dear to science,—even then, his long continued professional employment and the various public stations he filled, in addition to frequent ill health, deprived him of a large share of those advantages. The vast stock of knowledge which, under such untoward circumstances, he actually acquired, is therefore an additional proof of his native strength of intellect.

But, wonderful as a kind of intuitive knowledge he possessed really was, his mental powers would probably have remained hidden from the world, they

following extract of a letter, addressed by him to Mr. Barton, on the 20th of September, 1756, being then little more than twenty-four years of age; viz. “ I have not health for a soldier,” (the country was then engaged in war,) “and as I have no expectation of serving my country in that way, I am spending my time in the old trifling manner, and am so taken with optics, that I do not know whether, if the enemy should invade this part of the country, as Archimedes was slain while making geometrical figures on the sand, so I should die making a telescope.”

would have been very imperfectly cultivated, at best, had not an incident apparently trivial, and which occurred when our Astronomer was a young boy, furnished what was, in all probability, the very first incitement to an active employment of his philosophical as well as mechanical genius.

Mr. Rittenhouse's mother having been already noticed somewhat particularly, the reason for this being done shall be here stated: it is connected with the incident just now referred to. This valuable woman had two brothers, David and Lewis Williams (or William), both of whom died in their minority. David, the elder of these, pursued the trade of a carpenter, or joiner. Though, like his nephew and namesake, he was almost wholly an uneducated youth, he also, like him, early discovered an unusual genius and strength of mind. After the death of this young man, on opening a chest containing the implements of his trade which was deposited at Mr. M. Rittenhouse's, (in whose family it is presumed he dwelt,) a few elementary books, treating of arithmetic and geometry, were found in it: With these, there were also various calculations and other papers, in manuscript; all, the productions of David Williams himself, and such as indicated not only an uncommon genius, but an active spirit of philosophical research. To this humble yet valuable coffer of his deceased uncle, Mr. Rittenhouse had free access, while yet a very young boy. He often spoke of this acquisition as a treasure;

inasmuch as the instruments of his uncle's calling afforded him some means of exercising the bent of his genius towards mechanism, while the books and manuscripts early led his mind to those congenial pursuits in mathematical and astronomical science, which were ever after the favourite objects of his studies.⁽²¹⁾

(21) "It is observable, that, in like manner, an accidental circumstance seems to have given the first impulse to the philosophical researches of that eminent mathematician, Colin Maclaurin, the friend and disciple of Newton. His biographer, Mr. Murdoch, relates, that "his genius for mathematical learning discovered itself so early as at twelve years of age; when, having accidentally met with a copy of Euclid in a friend's chamber, in a few days he became master of the first six books, without any assistance: and thence, following his natural bent, made such a surprising progress, that very soon after we find him engaged in the most curious and difficult problems."

It is not ascertained at what age Rittenhouse obtained access to his uncle Williams's little collection of books and papers; though it was, probably, before his twelfth year. But it is to be observed, that at the early age of twelve, Maclaurin had been a year at the University of Glasgow, where he was placed under the care of one of the most eminent and learned professors of the age; while Rittenhouse, for some years after that period of life, had his time occupied in agricultural pursuits, and was almost entirely uneducated.

One particular in which similar merit attaches itself to these two distinguished philosophers, is, that all their more serious studies were directed towards objects of general utility.

Having introduced the name of Maclaurin more than once into these Memoirs, the author of them cannot refrain from presenting to his readers the following epitaph upon that great mathematician. It is attributed to the late Dr. Johnson: the delicacy and chasteness of the sentiment, as well as the classical purity of the language, certainly render it a specimen of this species of composition worthy of the pen of that justly-admired writer.—

It being thus apparent, that not only Mr. Rittenhouse's mother but her brother David Williams were persons of uncommon intellectual powers, the writer thinks it fairly presumable, that our Astrono-

H. L. P. E.

Non ut nomine paterno consulat ;
 Nam tali auxilio nil eget ;
 Sed, ut in hoc infelici campo,
 Ubi luctus regnant et pavor,
 Mortalibus prorsus non absit solatium :
 Hujus enim scripta evolve,
 Mentemque tantarum rerum capacem,
 Corpori caduco superstitem crede.

The writer of the *Adversaria*, in a respectable periodical publication,* observes, that "it would not be easy to do justice to this elegant and nervous sentence, in English." But, as he has given a very good prose translation of it into our language, the subjoined versification of this was attempted by a young lady, at the request of the writer of these memoirs :—

Not to perpetuate his father's praise,
 For no such aid his lofty fame requir'd,
 Did filial piety the marble raise ;
 But other thoughts the friendly deed inspir'd.

Here, in this tearful vale, where sorrow dwells
 And trembling mortals own the reign of fear,
 At his command, the sculptur'd tablet tells,
 Where hope exists, to dry the wand'rer's tear.

For, read his works, O man ! and then believe,
 The mind that grasp'd at systems so sublime,
 Beyond the mortal part must ever live,
 And bloom, in sacred heav'n's ethereal clime.

* The Port-Folio.

mer inherited his genius from his mother's family.⁽²²⁾
His surviving brother has decidedly expressed this

(22) In order to gratify the curiosity, if not to remove the doubts, of such persons as are not disposed to believe in the reality of any thing like an hereditary power, bias, or propensity of the mind, the following memorable instances are selected from many others which might be adduced; to shew that mental faculties, as well as corporeal qualities and even mental and bodily diseases, are sometimes inherited by children from their parents: perhaps cases of this kind exist more frequently than is either observed or imagined.

Mr. James Gregory, the inventor of the reflecting telescope in common use, called the Gregorian, was one of the most distinguished mathematicians of the seventeenth century. This eminent man, who was born at Aberdeen in Scotland in the year 1638, was a son of the Rev. Mr. John Gregory, minister of Drumoak in the same county: his mother was, moreover, a daughter of Mr. David Anderson, of Finzaugh, a gentleman who possessed a singular turn for mathematical pursuits.

Mr. David Gregory, a nephew of the foregoing, was some time Savilian professor of astronomy at Oxford. This *Subtilissimi Ingenii Mathematicus*, as he is styled by his successor Dr. Smith, was born at Aberdeen, in the year 1661. Of the four sons of this celebrated mathematician,—

David, a mathematician, was regius professor of modern history, at Oxford;

James was professor of mathematics, at Edinburgh; and

Charles was also professor of mathematics, at St. Andrew's.

Besides these men of genius in the same family, was the late Dr. John Gregory, professor of medicine in the University of Edinburgh; who had previously held the philosophical chair in the University of St. Andrews, from which he delivered lectures on the mathematics, experimental philosophy, and moral philosophy. This gentleman was grandson of the inventor of the Gregorian telescope, son of Dr. James Gregory, professor of medicine at Aberdeen, and father of another James, successor of Dr. Cullen, in the medical chair at Edinburgh.

opinion : in a letter on the subject of the deceased, addressed to the writer of these memoirs soon after

A mathematical genius was hereditary in the family of the Andersons ; and, from them, it seems to have been transmitted to their descendants of the name of Gregory. Alexander Anderson, cousin-german of David abovementioned, was professor of mathematics at Paris, in the beginning of the eighteenth century ; and published there in 1712, *Supplementum Apollonii redtvioti*, &c. The mother of the James Gregory, first named, inherited the genius of her family ; and observing in her son, while yet a child, a strong propensity to mathematics, she herself instructed him in the elements of that science.

Margaret, the mother of the late Dr. Thomas Reid, professor of moral philosophy in the University of Glasgow, was a daughter of David Gregory, Esq. of Kinnardie in Banffshire, elder brother of the James Gregory first mentioned. It is remarked by a celebrated writer, that "the hereditary worth and genius which have so long distinguished, and which still distinguish, the descendants of this memorable family, are well known to all who have turned their attention to Scottish biography : but it is not known so generally, that in the female line, the same characteristic endowments have been conspicuous in various instances ; and that to the other monuments which illustrate the race of the Gregories, is to be added the philosophy of Reid."—(See Dugald Stewart's *Account of the Life and Writings of Dr. Reid*.)

The great mathematical genius of the celebrated astronomer, John Dominick Cassini, descended to his great-grandson. John-James, the son of John-Dominick, who inherited the genius of his father, succeeded him as professor of astronomy in the Royal Observatory at Paris, a place which the father had filled more than forty years : John-James's son, Cæsar-Francis Cassini de Thury, (who died in the year 1784, at the age of seventy years,) was an eminent astronomer : and his son, the Count John-Dominick de Thury, was also a distinguished astronomer.

The eldest of these Cassini's was a native of Italy, and born in 1625. He died in the seventy-seventh year of his age ; and in the year 1695, a medal was struck to honour his memory, by order of the king of France.

Dr. Rittenhouse's death, he says—"I am convinced his genius was more derived from his mother, than from his father."

A casualty that occurred in the year 1756, appeared to have been very near depriving the world of the talents, services, and example of our Philosopher, at a very early period of those pursuits in which he was afterwards so eagerly engaged. This circumstance is thus narrated by himself, in a letter dated the 26th of July, in that year, and addressed to the Rev. Mr. Barton, at his then residence in Redding township, York county.⁽²³⁾

These instances of genius in three families, afford striking examples of its being sometimes hereditary. It is further observable, that, in the case of the great professor Simson, his mathematical endowments were said to be derived from his mother's family; as Mr. Rittenhouse's were likewise supposed to have been from that of his mother.

(23) Mr. Barton resided on a farm, near what are called the Sulphur Springs (now comprehended within the limits of the new county of Adams,) from some time in the year 1755, until the spring of 1759; during which period he officiated as a missionary from "the society," established in England, "for the propagation of the gospel in foreign parts," for the counties of York and Cumberland. While he resided in that then remote settlement of Pennsylvania, he was greatly instrumental, both by his precept and example, in stimulating the people to avenge the numerous barbarities perpetrated on the inhabitants and their property in that frontier, by their French and Indian enemies. In the expedition against Fort Du Quesne (now Pittsburg,) undertaken in the year 1758, under the orders of brigadier-general Forbes, he served as a chaplain to the forces then employed, by virtue of a commission from governor Denny: and in that campaign he became personally acquainted not only with the com-

“I was,” said our young philosopher, “obliged to ride hard to reach Lancaster, the evening after I left you; and being somewhat tired myself, as well as my horse, I determined to go to the Dunker’s-Town,⁽²⁴⁾ where I staid the remainder of that day and the night following. I was there entertained with an epitome of all the whimsies mankind are capable of conceiv-

mander in chief, but, among others, with colonel (afterwards general) Washington; colonel (afterwards general) Mercer; colonel Byrd of Virginia; colonel Dagworthy; colonel James Burd of Pennsylvania; all provincial officers of great merit; besides colonel (afterwards general) Bouquet, sir John St. Clair, sir Peter Hacket, major Stewart, and other gentlemen of worth and distinction, who held commands in the British regiments engaged in that service. With most of these very respectable military characters Mr. Barton occasionally corresponded, afterward; and his services, during a residence of between three and four years in that part of Pennsylvania, were honourably acknowledged, as well in England as among his fellow-citizens, in various instances.

After Mr. Barton left the county of York, he became established in Lancaster, where he officiated as rector of St. James’s church in that borough, and missionary to the large and respectable country-congregations of Caernarvon and Pequea, nearly twenty years.

(24) Although commonly called Dunker’s-Town, the proper name of this once noted village is Ephrata. The little community which formerly resided there, usually styled Dunkers, date the origin of their sect about the year 1705. The original members of this religious society, in Germany, Switzerland, and some other parts of Europe, having been persecuted and banished from their homes, assembled themselves in the duchy of Cleves, under the protection of the king of Prussia: and from thence they migrated to Pennsylvania, mostly between the years 1718 and 1734, a few of them only remaining behind. See also the next note.

ing. Yet it seemed to me the most melancholy place in the world, and I believe would soon kill me were I to continue there; though the people were exceedingly civil and kind, and the situation of the place is pleasant enough.⁽²⁵⁾ From thence I went homewards,

(25) The proper name of this place is Ephrata; and the very singular religious society to whom it belongs, are denominated Seventh-Day Baptists.

The society is said to have originally consisted of about twenty families who migrated from Germany to Pennsylvania, about the year 1718 or 1719; part of whom settled at this place, and founded the village of Ephrata (the head-quarters of the sect,) which is situated about thirteen miles, north-eastward, from Lancaster, on a little stream called the Cocolico-creek. These people hold the doctrine of an universal redemption, ultimately, denying the eternity of future punishment; that war and judicial oaths are unchristian; and that it is not justifiable to take interest, for money lent. They keep the seventh day of the week as their sabbath, and baptize by submersion; whence they derive their name: they also inculcate the propriety of celibacy, and of maintaining a community of goods; but when any of them marry, and acquire property independent of the society in Ephrata, they are obliged to retire from thence and reside elsewhere. The men generally wear their beards, and clothe themselves in a habit not unlike that of the Carmelites or White Friars: the women dress like nuns. Both men and women observe great abstemiousness in their diet, living chiefly on vegetables, and submit to some privations and corporal severities, besides, in their religious discipline; they lie upon benches, with a wooden block instead of a pillow: but though meek, humble, and even timid, in their deportment, they are very civil to strangers who visit them.

The society of Ephrata is supported by cultivating their lands, conducting a printing-press, a grist-mill, a paper-mill, a saw-mill, a tan-yard, &c. and the women are employed in spinning, knitting, sewing, making paper-lanterns and other toys, &c.

The village consists of about ten or a dozen buildings; and is mostly composed of the cloisters and convent, two churches,

through Reading;⁽³⁰⁾ where I was agreeably surprised, the number and goodness of the buildings far exceeding my expectations.

and the mills. One of their places of worship adjoins the sisters' apartments, as a chapel; another belongs to the brothers' apartments: and to these churches, the brethren and the sisterhood respectively resort, every morning and evening, sometimes, too, in the night, for the purpose of worshipping; much of which is made up of soft and melodious chanting, by the females. There is said to be one other place of worship, wherein all the members of the society, within the bounds of the settlement, meet once a week to celebrate worship publicly.

Such, indeed, *was* the pleasant, sequestered little village of Ephrata, at the time our then very young philosopher visited it; and such was the condition of that little-known sect of Christians, while the society continued under the direction of their second and last president, the late Mr. Peter Miller. This venerable old German, who had been bred to the priesthood in some one of the Protestant churches of his native country, became a convert to the principles of this obscure ascetic sect, over which he long presided with much reputation, after the death of its reputed founder, CONRAD BEIXLER, his patriarchal predecessor. But, though possessing a good share of the old scholastic learning, with a large portion of piety, the mind of Mr. Miller was strongly tinctured with many mystical notions in divinity; such as well comported with the "whimsies" of the religious society he governed.

Since the death of this good man, the ancient discipline of the religious community at Ephrata, which had become greatly relaxed during the revolutionary war, has almost wholly disappeared. The chief seat of the Seventh-Day Baptists is no longer what it was: for, in lieu of the solemn devotional stillness of the secluded cloysters and cells of its once monastic inhabitants, and which, at this time, are nearly deserted, are now substituted various occupations of industry, amidst "the busy haunts of men."

A letter from lady Juliana Penn to the second and last worthy president of this little religious society, has a place in the Appendix. It is indicative of the goodness of her ladyship's heart.

“You have perhaps seen, in one of the last papers, an account of the prodigiously large hail-stones which fell in Plymouth.⁽²⁶⁾ The lightning struck a tall green poplar standing in our meadow, just before the door, and levelled it with the earth. I was standing between the tree and house; and, at the same instant that I saw the flash of lightning, felt a most violent shock through my whole body,—and was stunned with such a horrible noise, that it is impossible for imagination to represent any thing like it.”

The advantages and the disadvantages, which Mr. Rittenhouse respectively enjoyed and encountered, until after he had attained to the period of manhood, have been mentioned; and it will be readily perceived, that the latter greatly outweighed the former, in every other particular than that of his native genius, which alone was sufficient to preponderate against innumerable difficulties.

The great deficiencies in his education, as well as their causes, having been misconceived and incorrectly represented in some publications, a due regard to truth demands a correction of such mistaken opinions.

(26) The county-town of Berks, in Pennsylvania, pleasantly situated on the Schuylkill, about fifty-six miles, north-westward, from Philadelphia.

(27) A neighbouring township to Norriton, the place of Mr. Rittenhouse's country residence.

Soon after his death, there appeared in the *Maryland Journal*, "*Anecdotal Notices of Mr. David Rittenhouse*;" which, although written with some ingenuity and knowledge of the subject, contained several errors. It is therein asserted, among other things, that "his parents, *incapable* of giving him any other education than common reading and writing, intended to have brought him up to country-business; but, being blessed by nature with a mechanical turn of mind, he soon gave specimens of his ingenuity in making wooden clocks: This so recommended him to notice, as to give him an opportunity of learning the clock-making business."—It has been already shewn, that Mr. Rittenhouse never received the least instruction in any mechanic art; and it is not ascertained that he ever made more than one wooden clock. It is also notoriously an error, that his parents were "*incapable*" of giving him any other education, than the common schooling he received: they were by no means poor, though not wealthy. His father inherited some patrimony; and he had, besides, been about nine years concerned in conducting the paper-manufactory near Germantown, after his one-and-twentieth year, before he purchased the Norriton farm.⁽²⁸⁾ This part of his estate he was enabled to give to his eldest son, David, about the year 1764; prior to which time the old gentleman removed to a farm he had purchased, near-

(28) This farm contained about one hundred and fifty acres. It was lately sold by the heirs of Dr. Rittenhouse.

ly adjoining it in Worcester township, and on which he had erected a good two-story stone dwelling-house with suitable out-houses. There Mr. David Rittenhouse's father and mother afterwards resided, together with their other son, Benjamin, (the house being so constructed as, conveniently, to accommodate two small families,) until the death of old Mrs. Rittenhouse in the autumn of 1777, at the age of seventy-three years, and of her husband in the autumn of 1780, in the seventy-eighth year of his age. The Worcester farm was left to the younger son: and, in addition to these not inconsiderable establishments for his sons, the old gentleman had given small portions to each of his five daughters, when they severally married. The remains of this worthy and upright man, for he truly merited that character, were interred in the cemetery belonging to a Baptist congregation, in the neighbourhood, in which both he and his wife had long attended divine worship. But, some years before his death, the old gentleman disposed of a lot of ground very near to his own house,—and *gratuitously*, if the writer's information be correct,—to a Presbyterian congregation, for a burial place, and site for a church they were then about to erect. If this little piece of land was a *donation* to the religious society to whom it belongs, the grant of it, though not of great value, furnishes an instance of that liberality of sentiment and goodness of heart which characterized our Astronomer's father, and to which some allusion is before made.

When, therefore, all the circumstances here mentioned, respecting Matthias Rittenhouse's property and condition of life, shall be taken into view, it will be evident that he possessed a decent competency; with an estate quite independent, though not large: for he never enjoyed what is now termed affluence.

Concerning our Astronomer's early life and condition, even his eloquent eulogist, Dr. Rush, was mistaken in some particulars. His assertion, that Mr. Rittenhouse was descended from parents "distinguished for probity, industry, and simple manners," is perfectly correct. But, although he was comparatively "humble" in his "origin," his father held the highly respectable station of an intelligent, independent farmer;⁽²⁹⁾ and it has been also seen, that his paternal ancestors, for some generations in succession, were proprietors of considerable manufactories of an article important in commerce and the arts, and eminently useful in literature and science as well as in the common affairs of life.

Dr. Rush has remarked, in regard to Mr. Rittenhouse's talents first becoming generally known, that "the discovery of his uncommon merit belonged chiefly to his brother-in-law, the Rev. Mr. Barton, Dr. Smith, and the late Mr. John Lukens." Perhaps it

(29) "Omnium autem rerum, ex quibus aliquid acquiritur, nihil est agriculturâ melius, nihil uberius, nihil dulcius, nihil homine, nihil libero dignius." Cic. *De Offic* ii. 42.

might be said, with greater strictness, that the "discovery" here spoken of, belonged solely to Mr. Barton; by whom it was communicated, very early, to his learned and reverend friend, Dr. Smith,—and through him, to the ingenious astronomical observer, Mr. Lukens, (afterwards surveyer-general,) as well as some other distinguished characters of that time. The writer in the Maryland paper before referred to, after having noticed the prevailing opinion that Mr. Rittenhouse was *self-taught*, had corrected the full extent of that misconception, in these words:—"This is not strictly true; for, while engaged in these acquirements," (astronomy, &c.) "the Rev. Mr. Barton, a learned episcopal clergyman of Lancaster, married his sister."—"Mr. Barton, admiring the simplicity of manners and natural genius of his brother-in-law, afforded him every assistance in his power,—not only in mathematics, but in several other branches of literature: Mr. Rittenhouse was worthy of his notice; for he lost no time, and spared no pains, to improve himself in knowledge, as far as his limited education would permit."

Hence, as well as from the preceding narrative, it will appear that Dr. Rush was led into a further mistake, respecting Mr. Rittenhouse.—In regard to his exalted genius, the learned professor has amply done justice to his memory. He has, in particular, recorded one extraordinary fact, in proof of his genius, well worthy of notice; and which is therefore related in

the Professor's own words.—“It was during the residence of our ingenious philosopher with his father, in the country, that he made himself master of Sir Isaac Newton's *Principia*, which he read in the English translation of Mr. Motte. It was here, likewise, he became acquainted with the science of Fluxions; of which sublime invention he believed himself, for a while, to be the author: nor did he know for some years afterwards, that a contest had been carried on between Sir Isaac Newton and Leibnitz, for the honour of that great and useful discovery.” Then exclaims the ingenious eulogist, in terms of well-founded admiration, “What a mind was here!”—But, immediately after, he adds—“*Without literary friends or society, and with but two or three books, he became, before he had reached his four-and-twentieth year, the rival of two of the greatest mathematicians in Europe!*”—The circumstance must, then, have escaped Dr. Rush's recollection—if indeed he had ever been made acquainted with it,—that five years before Mr. Rittenhouse attained to the age of twenty-four, he found at least one literary friend, in Mr. Barton; whose intimate society he long enjoyed, prior to that period; and that, through his means, he had access to many books.⁽³⁰⁾

(30) The opinion, that Mr. Rittenhouse was, in his youth and the first years of his manhood, “without literary friends or society, and with but two or three books,” though erroneous in fact, was propagated pretty early; and that opinion has, since, generally prevailed. About twenty-two years before his death, a

It is not meant to be insinuated, however, that Mr. Barton ever gave Mr. Rittenhouse any insight into the knowledge of fluxions; or, indeed, much instruction, if any at all, in other of the higher branches of

book was published in Philadelphia, under the title of *Caspius's Letters*; of which the Rev. Mr. Duché, then assistant-minister of Christ-church and St. Peter's in that city, was the writer. In that pleasant little work, its amiable and worthy author (who has been dead many years) has thus mentioned our philosopher. "After taking a few turns in the garden, we walked back again to the college, where we had appointed to meet the modest and ingenious Mr. Rittenhouse, who, *without one single advantage from a private tutor, or public education*, by the mere force of genius and industry, may now justly be reckoned the first astronomer and mathematician in the world."

Under such circumstances as these, it is by no means a matter of surprise, that Dr. Rush should have been led into a similar mistake.

It is, nevertheless, truly astonishing to find an American writer (the late Rev. Mr. Linn,) who, five years after Dr. Rittenhouse's death, published in Philadelphia, where both resided, a poem entitled, "The Powers of Genius;" but, in which the name of RITTENHOUSE is not once noticed! And yet that gentleman had not omitted to introduce, in one of his notes, an observation which shews, that an European philosopher, also of sublime genius, was present to his mind's eye!—"From the exhibitions of American talents," said Mr. Linn, "I indulge the warmest expectations. I behold, in imagination, the NEWTONS, the MILTONS, and the ROBERTSONS, of this new world; and I behold the sun of genius" (likewise "in imagination," it is presumed,) "pouring on our land his meridian beams."

The writer of these memoirs believes Dr. Linn to have been a very worthy, as well as an ingenious man: as such, he regrets his premature death, and entertains a respect for his memory. But he could not, in justice to the merit of Dr. Rittenhouse's character, pass unnoticed so unaccountable an omission as the one just mentioned, in Dr. Linn's Poem.

mathematics : because the first named gentleman never did himself pretend to the character of a profound mathematician ; and because, likewise, although always esteemed a man of learning, his pursuits in science and literature were chiefly directed to objects of a different nature. That Mr. Rittenhouse derived some instruction and information from his early acquaintance with Mr. Barton, is certain : but, whatever may have been the extent of the literary advantages which the latter was enabled to confer on his young friend and companion, they could not in any degree derogate from the intrinsic excellence and greatness of our Astronomer's innate genius.

That a mind so formed as that of our young philosopher—situated in life as he was—should have impelled him to assume the business of clock-making, can not be a matter of surprize : this occupation, connected with that of a mathematical instrument maker, is such as may be well supposed to have presented itself to his youthful ingenuity ; being in accordance with the philosophical bent of his genius in his early years, while yet untutored in science and unknown to the world.

The great utility of the common clock, in measuring time, is universally known. It possesses numerous and manifest advantages, beyond those of sun-dials, clepsydræ, sand-glasses, and other horological instruments, by reason of its vastly superior accuracy : the

sun-dial, indeed, is oftentimes wholly useless in all situations, even in the day-time; and always necessarily so, at night.

But the many improvements which have been made in modern times, in chronometers,—more especially in pendulum-clocks,—have very much advanced a correspondent accuracy in astronomical observations: and these improvements, together with those lately made in telescopes—chiefly by Dr. Herschel, the discoverer of the *Georgium Sidus*⁽³¹⁾—afford good

(31) Dr. Herschel, by means of his admirable telescopes, the most powerful that have ever been constructed, discovered on the 13th of March, 1781, a new planet without the orbit of Saturn, called the *Georgium Sidus*. The newly discovered star was thus named by Dr. Herschel himself, in honour of his patron King George III. by whose bounty he was enabled to construct, and to make incessant and laborious observations with those wonderful telescopes, by which this astronomer has extended our knowledge of the planetary and sidereal system, far beyond its former limits.*

Some astronomers on the continent of Europe, and in America likewise, have affected to call this new planet *Herachel*; while others have endeavoured to give it the name of *Uranus*. Would it not be well, in order to avoid the perplexity and confu-

* Herschel, in calling his newly-discovered planet by the name of his patron, was not without illustrious precedents for so doing. When Galileo discovered the four Satellites of Jupiter, in the year 1610, he named them the *Medicea Sidera*, in honour of the family of Medici, his patrons. And Cassini, who, in the years 1671, 1672, and 1684, successively, discovered the fifth, the third, and the first and second Satellites of Saturn, denominated these stars, *Sidera Iodoicea*, in honour of Louis XIV. in whose reign, and observatory, they were first discovered. The fourth Satellite of Saturn (but the first of them, in the order of time, that was known) had been previously discovered by Huygens, sixteen years before any one of the others was known to exist.

grounds for hoping, that yet further and more important additions will continue to be made to the recent discoveries in astronomy.

sion arising from various names for the same thing, that astronomers of eminence should designate this planet, in future, by the name which the discoverer—who, it may be presumed, was best entitled to give it a denomination—chose to apply to it? It is a strange kind of compliment to Dr. Herschel, if it could have been intended as a mark of respect to him, to refuse an adoption of that name which he had assigned to his own discovery; even by changing it for that of the Doctor himself! He wished this planet, no doubt, to retain the appellation of *Georgium Sidus*, as a memorial of his grateful respect for his royal benefactor; and in this object of his wish he would be disappointed, by changing it for any other.

The name *Uranus* is also objectionable, and on another ground. Uranus was a fabulous personage. It is pretended, that in the isle called *Panchay*,* to the east of Africa, is to be seen on a column of gold, a recital of the principal actions of Uranus, together with those of Saturn and Jupiter. It is said that the former was the most ancient king in the world; and that, having been a just and beneficent man, well versed in the knowledge of the stars, he was the first who offered sacrifices to the gods of heaven. We are also told, that in the island just named is a mountain, where Uranus, holding the sceptre of the world, took great pleasure in contemplating the firmament and the stars. Among the sons of this monarch, according to the same fiction, the two most distinguished were Atlas and Saturn, who partitioned between them their father's kingdom; and Atlas, who in the division acquired the sea-coasts, is said to have excelled in astrology: his reign is placed about sixteen hundred years before the Christian era, and he is therefore ranked as a co-temporary of Moses.

* So written by Lalande. There is an Asiatic island called *Panay*: it is one of the Philippines, and lies, as *Ranchay* is said to do, "to the east of Africa."

Further improvements may also be expected to take place, in the construction of watches and other spring-

Such is the fabulous history of Uranus! whose name some Christian philosophers seem desirous to perpetuate, with honour, by attaching it to a newly-discovered world! It would be extremely difficult if not impracticable (and, perhaps, even if practicable, the attempt would not be advisable at this time of day,) to abolish such of the names of the heavenly bodies as are derived from the appellations of the false gods of antiquity. But it appears very questionable, whether it be consistent with propriety and a due regard to truth, to connect fable, in any manner, with established and important realities; or whether it be right to dignify the heathen mythology and the preposterous annals of fabulous ages, by unnecessarily associating any thing relating to them, with objects of genuine and useful science.

Baron Bielfeld seems to entertain similar sentiments on this head, when (treating of the mathematics, in his "Elements of Universal Erudition,") he observes, that "the fables of ancient poets concerning the stars, and," he adds, "the fancies of some modern Christian astronomers, who have given them names borrowed from the holy scriptures, do not deserve the least attention, when we would treat seriously on this science." There is much justice in this observation of the learned and ingenious baron: But if the application of names derived from sacred writ, to the stars, be censurable; how much to be condemned among Christians is the practice of giving, even in our day, and in a science which has philosophical truth for its object, the names of heathen deities, and fabulous persons of antiquity, to the celestial bodies! Is it proper, can it, in any way, promote the interests of true science or the attainment of useful knowledge, thus to commemorate any of the absurdities of a false and impious mythology; or any of those traditional personages of the early ages, whose history, as handed down to us in the reveries of the ancient poets and other profane writers, are either enveloped in fable or inexplicable mystery? But to return from this digression:—

Mr. Lalande remarks in his great work on astronomy, which was published in the year 1792, that Louis XIV. gave to astronomers unceasing marks of the interest he took in their labours;

chronometers; so as to render them still more useful for the purposes of navigation, by ascertaining with greater precision the longitude at sea.⁽³²⁾ For this

and that George III. occupied, with great delight, much of his time in his Observatory at Richmond, as well as in Herschel's at Slough. In his own, in Richmond Gardens, the king of England has noble and beautiful instruments; among which are a mural arch of 140° and 8 feet radius, made by Sisson, a sector of 12 feet, a transit telescope of 8 feet, made by Adams, and a telescope of 10 feet of Herschel. This grand Observatory was erected in the year 1770, under the direction of Dr. Bevis: it is 140 feet in front, and consists of two stories.

Such princes, then, as Louis XIV. and George III. deserve to be honourably mentioned in the records of astronomical science: and it was meritorious in Dr. Herschel, to dedicate to so munificent a patron and promoter of astronomy as the latter sovereign, in the way he has done, his important discovery of a new planet.

It is noticed by the writer of the article "Astronomy," in Dr. Brewster's *New Edinburgh Encyclopædia*, (the first volume of which has been very lately reprinted in Philadelphia,) that the venerable Herschel,* at the advanced age of seventy-two years, still continued to observe the heavens with the most unwearied assiduity: and that his contemplated "successor," who, it is presumed, is his son, "promises to inherit the virtues and the talents of his father."

(32) Philip III. king of Spain, first offered a reward for the discovery of the longitude, about two centuries ago; and the States of Holland, soon after, followed his example. The Regent of France, during the minority of Louis XV. also promised a great reward to any person who should discover the longitude at sea.

* "Herschel, with ample mind and magic glass,
Mid worlds and worlds revolving as they pass,
Pours the full cluster'd radiance from on high,
That fathomless abyss of Deity."

Purs. of Lit. dial. the fourth.

purpose, the finely-improved English time-keepers of Harrison, Mudge, and others, have been found of the greatest utility. Mr. de Zach, (in his *Explanation and uses of the Tables of the Motions of the Sun*,⁽³³⁾) after some observations on determining

In the year 1714, the parliament of Great Britain offered a reward for a like discovery; and if the method, to be proposed, should determine the longitude to twenty geographical miles, the premium was to be twenty-thousand pounds sterling. The act of parliament established a board of Commissioners of the Longitude. Several other acts were passed, in the reigns of Geo. II. and III. directed to the same purpose. Finally, in the year 1774, all those acts were repealed, by one offering separate premiums for finding the longitude; either by the lunar method, or by a watch keeping true time,—or by any other method practicable at sea. This act proposes as a reward for a time-keeper, 5000*l.*, if it determine the longitude to one degree or sixty geographical miles,—7500*l.*, if to forty miles,—and 10,000*l.*, if to thirty miles. If the method be by improved Solar and Lunar Tables, constructed upon Sir Isaac Newton's theory of gravitation, the author is to receive 5000*l.*; provided such Tables shall show the distance of the Moon from the Sun and Stars within fifteen seconds of a degree, answering to about seven minutes of longitude, after making an allowance of a half a degree for the errors of observation. The Commissioners have the power of giving smaller rewards, at their discretion, to persons making any discovery for finding the longitude at sea, though it may not be within the above limits.

The set of Solar and Lunar Tables which were sent to the Board of Longitude, about the year 1763, by the widow of the celebrated astronomer, Tobias Mayer, were honoured with a reward of 3000*l.* sterling, by an act of the British parliament, in consideration of their great usefulness in finding the longitude at sea.

(33) See Mr. de Zach's great work, entitled, *Tabulæ Motuum Solis novæ et correctæ*, &c.

differences of longitude by means of astronomical observation, says,⁽³⁴⁾—"De cæteris longitudinem de-

(34) For the use of such readers as may not be acquainted with the Latin language, the following translation of the above is given, from the original of Mr. de Zach.

"Concerning the means of determining the longitude, this is not the proper place to treat: of one, however, the marine or nautical time-keeper, it will not be foreign to our purpose to say something.

"It is now about thirty years, since those very ingenious makers of time-keepers, Harrison, Cummings, Kendal, Arnold, and Mudge, among the English,—Le Roy, and Berthoud, among the French,—devised various and excellent ones for the use of navigators, and brought to a great degree of perfection those marine watches, called by the English, Time-keepers. As every one knows their use in ascertaining the longitude, on a *sea-voyage*, I shall not say any thing more of them here.—A similar time-piece, made by the celebrated watch-maker Mr. Thomas Mudge, and often referred to in the royal observatory of Greenwich, was, in 1784, made use of by the Hon. Vice-Admiral (John) Campbell, commander of the naval squadron* on the Newfoundland station,—going thither and returning; and from that time was diligently examined, at the observatory of his Excellency Count Bruhl, in Dover street London.

"This very marine time-piece was confided to my charge, in the year 1786, for the purpose of determining the longitudes of my journey by land; when, called from London by his Serene Highness the Duke of Saxe-Gotha,—the patron of all the sciences and liberal arts, but more especially favouring astronomy,—I returned to Germany; where the erecting of a complete and splendid Observatory, at Gotha, was placed under my direction.† I then took with me, by the command of his Serene Highness, a watch of a smaller size, which he usually carried in his fob,—called by the English a Pocket-chronometer,—made by a London artist, Mr. Josiah Emery:‡ which, being made with the greatest ac-

* Here is a reference, in the text, to note 35.

† Here is a reference, in the text, to note 36.

‡ Here is a reference, in the text, to note 37.

terminandi modis, non est hic disserendi locus;—de uno vero, horologiâ maritimâ seu nauticâ, quidquam adjicere non alienum erit. Triginta jam abhinc annis, ingeniosissimi horologiorum artifices, Harrison, Comings, Kendal, Arnold,* Mudge, apud Anglos,—Le Roy et Berthoud apud Gallos, varia navigantium usui, egregia excogitaverant, et ad magnum perduxerant perfectionis gradum, horologia nautica, (Anglis, Time-keeper.) Cum eorum in longitudinibus itenere maritimo definiendis, usum quisque norit, plura hic dicere abstineo; simile horologium ab ingenioso horolopega Thom. Mudge constructum, in Observatorio Regio Grenovicensi sæpius exploratum, anno 1784, a Clar.

curacy and ingenuity, yielded nothing in point of correctness to the larger nautical time-keepers, as may be seen from three tables of their movements by the illustrious Count Bruhl, and also of others, by Dr. Arnold, lately established by authenticated certificates.

"About the end of the year 1786 and the beginning of 1787, I accompanied His Serene Highness, in a tour through Germany, France and Italy. In this journey, the longitudes of several places and astronomical observatories were determined, from a comparison of the time of a nautical time-keeper (which was set by the solar mean time in Dover street, London,) with the mean time of the place; which appears by the altitudes of the sun, by Hadley's sextant—those which we call *corresponding*, or by a comparison with it, as transmitted to us in observatories, by those astronomers. By the same instruments, therefore, when I arrived at Gotha, I ascertained the longitude of the future observatory there, with the greatest care and attention; which the Duke, going to London a few days after, taking with him his chronometer, at length fully verified."

Pocket-chronometer,) a Londiniensi artifice, D. Josiah Emery,⁽³⁷⁾ constructum, quod summâ accuratone et

of their most celebrated mechanicians : while his profoundness in astronomical science, and his wonderful ingenuity of invention and contrivance, manifested in the construction of his Orrery, leave him without a rival, in the two-fold character of an Astronomer and a Mechanic. The idea of the fine planetarian machine constructed by Mr. Rowley, under the name of the Orrery, and supposed to have been invented by Mr. Graham, is said to have been taken from a very similar machine, of which that eminent philosopher, Dr. Stephen Hales, had the credit of being the original contriver. But Mr. Rittenhouse was, incontrovertibly, the Inventor, as well as the Maker, of that sublimely-conceived and unrivalled machine, which bears the name of the Rittenhouse-Orrery : and Dr. Morse, in noticing some of the more prominent productions of scientific ingenuity and skill, in America, observes, with good reason, that "every combination of machinery may be expected from a country, a native son of which," (referring in a note to "David Rittenhouse, Esq. of Pennsylvania,") "reaching this inestimable object in its highest point, has epitomised the motions of the spheres that roll throughout the universe." See Morse's *American Geography*, first published in 1789.

(37) The accuracy of some of the fine pocket-chronometers constructed by the celebrated artists named by Mr. de Zach, and by some others, such, for instance, as the one made by Emery for the count de Bruhl, mentioned in the text, has rendered them, on some occasions, useful assistants in making astronomical observations on land. Dr. Rittenhouse occasionally used one for such purposes, many years. It was an excellent pocket-watch, made by Le Roy of Paris for the late Matthias Barton, Esq. who was induced to let Dr. Rittenhouse have it. After his decease, this watch was gratuitously restored to its former proprietor, by Mrs. Rittenhouse's desire, and as a testimonial of what she knew to have been her late husband's regard for his nephew. Mr. M. Barton bequeathed it, by his last will, to his brother and physician, Dr. Benjamin S. Barton.

subtilitate elaboratum, nil majoribus cedit horologiis nauticis, ut videre licet ex tribus horum motuum elementis ab Illustr. Comite de Bruhl, et à aliorum Dr. Arnold, nuperrime publici juris factis. Sub finem anni 1786 et ad initium 1787, Serenissimum in itinere per Germaniam, Galliam, et Italiam, comitatus sum : hoc itinere quorundam locorum et Specularum astronomicarum longitudes definitæ sunt ex comparatione temporis horologii maritimi (quod ad tempus solare medium Londinense, in Doverstreet incedebat) cum tempore medio loci, quod sextante Hadleianâ per solis altitudines, quas correspondentes dicimus, vel ex comparatione cum illo, quod in Speculis Astronomicis ab ipsis astronomis traditum nobis fuit. Iisdem itaque automatis, cum primum Gotham advenissem, observatorii futuri longitudinem maximâ cum curâ atque diligentia definivi, quam paucis post diebus Serenissimus Dux Londinum profectus, chronometro suo secum deportato denuo perbelle comprobaverat.”

This very respectable testimony of an eminent German astronomer affords incontestable proof of the great accuracy, of which nautical chronometers are susceptible, and to which they have actually been brought by some artists of celebrity, mostly English.⁽³⁸⁾

(38) The Memoirs of the Royal Academy of Sciences at Paris, for the year 1799, contain an article that furnishes additional evidence of the extraordinary skill and ingenuity manifested by English artists in the construction of watches, as well as other pieces of mechanism which require great accuracy in the work-

The general use of the common clock ought not to derogate from the ingenuity of an invention of such universal importance in the affairs of human life. The pendulum-clock now in use was brought to some degree of perfection, if not invented, by Huygens,⁽³⁹⁾ who was one of the first mathematicians and

manship: it forms a pleasant little narrative in an eulogium on Father Sebastian,* a Carmelite Friar of singular mechanical ingenuity; and it indicates, at the same time, that the repeating-watch was invented in England. The story is thus told:—

“Charles II. roy d’Angleterre, avoit envoyé au feu roi deux Montres à Repetition; *les premières qu’on ait vues en France.* Elles ne pouvoient s’ouvrir que par une secrète précaution des ouvriers Anglois, pour cacher la nouvelle construction, et s’en assurer d’autant plus la gloire et le profit. Les montres se dérangèrent, et furent remises entre les mains de M. Martineau, horloger du roi, qui n’y put travailler faute de les sçavoir ouvrir. Il dit à M. Colbert, et c’est un trait de courage digne d’être remarqué, qu’il ne connoissoit qu’un jeune Carme capable d’ouvrir les montres, qu’il ne réussissoit pas, il falloit se résoudre à les renvoyer en Angleterre. M. Colbert consentit qu’il les donnât au P. Sebastien, qui les ouvrit assez promptement, et de plus les raccommoda sans sçavoir qu’elles étoient au roi, ni combien étoit important par ses circonstances l’ouvrage dont on l’avoit chargé.”

(39) This great man, who was the son of Christian Huygens lord of Zuylichem, a counsellor of the prince of Orange, was born in the year 1629, at Zuylichem, in the province of Guelderland, the country of the ancestors of Rittenhouse. Having resided for some time in France, he quitted that country on account of his religion, in 1684, in consequence of the revocation of the edict of Nantes. He died in Holland in 1695, at the age of sixty-six years.

Gallileo, who was a native of Florence, lived to the age of eighty-seven years. He died fifty-three years before Huygens; and about fourteen before Huygens’s application of the pendulum to

* His baptismal name was *John Truchet*.

astronomers of the age in which he lived: and the date of this invention is about the middle of the seventeenth century; although Gallileo disputed with him the discovery, a few years earlier. Clocks of some kind date their antiquity much higher; some writers pretending to carry their invention back as far as the year 510 of the Christian era. However, on the authority of Conrad Gesner,⁽⁴⁰⁾ the honour of inventing the clock, before the application of the pendulum to these machines was made by Huygens, belongs to England: He says, that "Richard Wallingford, an English abbot of St. Albans, who flourished in the year 1326, made a wonderful clock by a most excellent art; the like of which could not

clocks, so as to effect an *isochronal* regulation of their movements. Gallileo's use of the pendulum, for the purpose of measuring time, seems to have been nothing more than the annexation of a short pendulum to clock-work.

(40) This celebrated naturalist and physician, who was styled by Boerhaave, *Monstrum Eruditionis*, was born at Zurich in 1516: He was, probably, of the same family as that of the late Solomon Gesner the poet, who was a native of the same city, and appeared more than two centuries afterwards. Conrad Gesner was so distinguished a writer, as a naturalist, that he was called the Pliny of Germany. A splendid edition of Pliny's Natural History, under the title of the *Historia Mundi* of Caius Plinius Secundus, with a dedication by Erasmus to Stanislaus Turzo, bishop of Olmutz, was printed at Basil, by Froben, so early as 1525. This copy of Pliny (which is now very rare) having been published in the vicinity of Conrad Gesner, during his youth, that circumstance may have prompted him to direct his attention to those pursuits in science, which distinguished this learned Swiss.

be produced in all Europe.”⁽⁴¹⁾ This was forty-six years before Henry de Vic, a German, made his clock for Charles V. king of France; and fifty-six years before the duke of Burgundy ordered one, which sounded the hour, to be carried away from the city of Courtray, in Flanders.

Within our own day and a short period of time preceding it, great improvements have been made in the construction of the pendulum-clock,⁽⁴²⁾ as well as

(41) About two centuries after that period when the sciences had begun to revive and the mechanical arts to flourish, the construction of clocks appears to have been much improved. And in the reign of Henry VIII. a stately clock was made by an artist, the initials of whose name are “N. O.” in the year 1540, and placed in the royal palace at Hampton-Court. This not only shewed the hour of the day, but an orrery-part, connected with it, exhibited the motion of the sun through all the signs of the zodiac, and also of the moon, with other matters depending on them. A similar one, in the cathedral of Lunden in Denmark, is mentioned by Heylin: But Martin, in his *Philosophia Britannica*, speaks of a piece of clock-work in the cathedral of Strasburg, in Alsace; “in which, besides the clock-part, is the celestial globe or sphere, with the motions of the sun, moon, planets and fixed stars, &c.” This was finished in the year 1574, and is represented as being much superior to a pompous clock at Lyons, in France, which also has an orrery department.

(42) The first pendulum-clock made in England, was in the year 1662, by Mr. Fromanteel, a Dutchman.

In the library-hall of the Philadelphia Library-Company, is one of the clocks made by that artist, having this inscription engraven on its face, “*Johannes Fromanteel, Londini, fecit;*” but without any date. This clock was a donation to the library-company, in the year 1804, by Mr. Samuel Hudson, of Philadel-

in other descriptions of Chronometers.⁽⁴³⁾ Mr. Rittenhouse's early zeal in his practical researches into

phia, whose ancestor purchased it at an auction in London, after the restoration of king Charles II. The traditional account of it is, that it belonged, originally, to the Cromwell family; and, when presented, was said to be one hundred and forty years old: but it could not have been the property of the protector, Cromwell, the time of whose death was between three and four years anterior to Fromanteel's construction of a pendulum-clock.

(43) Besides the testimony of so distinguished an astronomer as Mr. de Zach, already given, respecting the very great accuracy to which time-keepers have been brought, the following translation, taken from what the celebrated Lalande has said in his treatise *Des Horloges Astronomiques*, (in the second volume of his *Astronomie*,) furnishes some curious and interesting facts on that subject.

"Short (the mathematical instrument maker,) upon the occasion of the transit of mercury over the sun observed in 1753, assures us that he had found by many observations, that his clock had not varied more than one second, from the 22d of February to the 6th of May (*Philos Trans.* 1753, p. 200;) so that, with a like pendulum, it is possible to obtain an exactness which, till this time, was thought incredible. There are English astronomers who have assured me," continues Lalande, "that pendulum-clocks have been made which did not vary more than five" in a year:* but that does not appear to me to be yet established as a fact; the oils that one is obliged to use in them are sufficient, by the change of consistency they undergo, to prevent such preciseness. The count de Bruhl, a great amateur and a perfect connoisseur also, on the subject of time-pieces, shewed me in London a diary of the going of two pendulums of Mudge, one of the most celebrated clock-makers in London: in one, there was a difference of half a second a day, between winter and summer;

* Even watches have been already brought to an inconceivable degree of exactness. Mr. Arnold and Mr. Emery made some, in the year 1786, which did not vary one second in a voyage of an hundred leagues.

astronomy, prompted him to desire the greatest possible accuracy in the construction of time-pieces adapted to astronomical purposes; and uniting, as he did, operative skill with a thorough knowledge of the principles upon which their construction depends, he was enabled—impelled by so powerful a motive—to display to the world, by his own manual ingenuity, the near approach to perfection to which the pendulum-chronometer may be brought. Besides his astronomical pursuits, his early employment in ascertaining the limits and fixing the territorial boundaries of Pennsylvania, and of some of the neighbouring states, obliged him to supply himself with chronometers of the greatest possible accuracy: and these were either made by his own hands, or under his immediate inspection by his brother, who, with the aid of his instruction, became an excellent mechanician. One of these fine instruments, bearing on its face the name of *Benjamin Rittenhouse* as the maker, and the date of the year 1786, is now in the possession of Mr. Norton

and in the other a second. Mr. Aubert has a pendulum made by Shelton, which varies also nearly a second in the day, in extreme seasons. Picard, in 1671, had a clock which did not lose a second in two months. But, whatever may have been, since that period, the skill of the clock-makers of Paris, we cannot obtain such exactness, but by mere accident and an equality of temperature in the atmosphere that is very rare: now, the correctness of our clocks is a necessary consequence of their principles; but these do not go so far. Mr. Emery has observed two clocks beat the same second, during three months; they were, however, very near to each other, and probably had some influence on one another by means of their foot-board or support."

Prior,⁽⁴⁴⁾ of Philadelphia: but that admirable one, the workmanship of which was executed by our Phi-

(44) This gentleman's name is connected with another circumstance in relation to Mr. D. Rittenhouse, which deserves to be noticed. He is in possession of a finely-graduated thermometer, made by our Philosopher; on the scale of which is engraved, by him, the record of a memorable fact concerning the climate of Pennsylvania, referring by a mark to 22° below 0, of Fahrenheit's scale; viz.—“*Jan. 2. 1762—Great Cold in Pennsylvania.*” This fact was ascertained by Mr. Rittenhouse, from a reference to the accurate Messrs. Masons and Dixon's Journal; in which, such was stated to have been the degree of cold in the forks of the Brandywine (about thirty miles westward, and very little to the southward, from Philadelphia,) on the day mentioned.

Mr. Rittenhouse had noticed, that, at his Norriton Observatory, (in lat. $40^{\circ} 9' 31''$ N.) the mercury in Fahrenheit's thermometer, not exposed to the sun-shine but open to the air, was at $94\frac{1}{4}^{\circ}$, on the 5th of July 1769; “which,” says he, “was the greatest height it had ever been observed to rise to, at that place.” But the writer is informed by a judicious and attentive observer, that at Lancaster, Pennsylvania, which is in lat. $40^{\circ} 2' 39''$ N. (the long. of this borough-town is $5^{\text{h}} 1' 4''$ W. from Greenw.) the mercury rose by Fahrenheit's scale, on the 7th of July, 1811, to $97\frac{1}{4}^{\circ}$. Admitting this to be correct, if $1\frac{1}{4}^{\circ}$ be then deducted, for the extra heat of so large a town as Lancaster in comparison with a country-situation, there is in this case the great range of 118° by Fahrenheit's scale, for the extremes of heat and cold in Pennsylvania.

The writer brought with him, from England, a meteorological diary kept in London, during the severe frost there, from the 7th day of January, 1776, to the 28th of the same month, both days inclusive. The greatest cold, during that period, was 15° and it is thus noted, in respect to the state of the atmosphere at the time; “Clear sky—*intense cold*—wind west.” The mercury rose on one day, within that time, to 34° . The mean degree of cold, in the same period, was there $26\frac{3}{4}^{\circ}$.

losopher himself, and which was part of the apparatus of his Philadelphia Observatory, is now placed in the hall of the American Philosophical Society.⁽⁴⁵⁾ This is constructed on a greatly improved plan of his own, which improvement was afterwards applied to that now belonging to Mr. Prior; and the latter is the same chronometer, it is believed, that was used by Mr. D. Rittenhouse, in fixing the northern line which divides Pennsylvania from New York, and in establishing the boundary line between the last mentioned state, and Pennsylvania and Massachusetts, respectively, in the years 1786 and 1787.—A description of

The greatest cold at Philadelphia, during the same days of January, 1776, was at 17° , but the mercury rose there, on one of those days, to 48° . The *mean* degree of cold at Philadelphia, in this corresponding period of time, was $29\frac{1}{2}^{\circ}$; being about $2\frac{1}{2}^{\circ}$ warmer (or rather, less cold,) than the general temperature of the weather in London, at the same time, in what was there called a "severe frost." Eighty-five degrees of Fahrenheit's scale is considered as a very extraordinary heat, in London: consequently, a range of 68° may be presumed to reach the extremes of heat and cold in England, in the latitude of nearly 52° N.*

Notwithstanding the extremes of heat and cold, which thus appear in the climate of Pennsylvania, Mr. Jefferson remarks (in his *Notes on Virginia*;) that these extremes are greater at Paris than at Williamsburg, the hottest part of Virginia. Yet Williamsburg, which is only about $2\frac{1}{2}^{\circ}$ to the southward of Philadelphia, is nearly $11\frac{1}{2}^{\circ}$ further south than Paris.

(45) See a description of this Chronometer, in the Appendix.

* Since writing the above, the author has ascertained, that in London, during the four last years of the last century, Six's thermometer, out of doors, averaged 49.6; that on the hottest day within that period, the mercury rose to 86; and that it fell, on the coldest day, to 4.

the principles of his observatory-chronometer here mentioned, together with some account of its mechanism, will be found in the Appendix : the former having been communicated to the writer of these memoirs by the ingenious Robert Patterson, Esq. director of the Mint ; and the latter by that able mechanician, Mr. Henry Voight, chief coiner in that institution,—a person who, by reason of his well-known skill as a clock and watch-maker, was employed by Mr. Rittenhouse more than forty years since, in the fabrication of some of his philosophical instruments.

The great accuracy and exquisite workmanship displayed in every thing belonging to the profession he pursued, that came through his hands, soon became pretty extensively known : and this knowledge of his mechanical abilities, assisted by the reputation he had already acquired as a mathematician and astronomer, in a short time procured him the friendship, respect and patronage, of some eminent scientific characters ; while it promoted his interest, in the profession he had thus newly chosen. In this he was, nevertheless, *self-taught* ; for he never received the least instruction from any person, in any mechanic art whatever : and, therefore, if he were to be considered as being merely an excellent artist, in an occupation intimately connected with the science of mathematics—*untutored*, as he was, in any art or science,—he would deservedly be deemed an extraordinary and eminent man. It will be perceived, however,

that it was the *union* of the almost unbounded powers of his genius, and his prodigious acquirements in a sublime science, with his wonderful abilities as a philosophical mechanic—and these faculties and attainments, moreover, combined with an amiable and virtuous character,—which constituted that celebrity so justly attached to his name.

Our young philosopher lived a retired, though by no means an inactive life, in his father's family, for several years after he arrived to (what is usually termed) lawful age. In this situation, which was a pleasant one in many respects, he long continued to enjoy the tranquil scenes of rural life, amidst the society of an amiable and very intelligent family-circle, and surrounded by many worthy and estimable neighbours, by whom he was both loved and respected. His chief occupation was the profession he had chosen ; but in such occasional intervals of personal abstraction from the mechanical part of his business, as the assistance the workmen he employed enabled him to obtain, he devoted much of the time to philosophical pursuits and study. Frugal in his expenditures, his industry furnished him amply with the means of comfort ; and in the plentiful and decent mansion of his father's family he experienced, with contentment, almost every gratification that a reasonable mind could desire. Good health seemed alone to be wanting to complete his happiness, in his earlier years ;

a privation which he felt through the greater part of his life.

Such was the condition of Mr. Rittenhouse, while he remained under the same roof with his father and mother, and some of their unmarried children. It was a mode of life which his disposition was calculated to enjoy; for, strongly attached to his kindred and friends by the benevolence of his nature, he derived much of his happiness from the reciprocal affections of a domestic circle and the kind intercourses of friendly esteem.

There does not appear to have been, for a long time, any occurrence that could have much disturbed the placid composure of our philosopher's mind,—until 1762; in which year his sister Anne died, in the twenty-sixth year of her age. She was the wife of Mr. George Shoemaker, a respectable citizen of Philadelphia, and a member of the religious society of Friends. A letter which Mr. Rittenhouse wrote to his brother-in-law Mr. Barton, in October 1762, announcing this event, indicates the keenness of his sensibility on the occasion. Mrs. Shoemaker was a woman of intrinsic worth; she died in the prime of life; and it is believed, she was the first of Mr. Rittenhouse's affectionate little band of brothers and sisters who had attained to the age of maturity, that he had then lost. After giving a circumstantial account of his sister's illness and death, he informs Mr.

Barton, that Mr. Daniel Stanton, an eminent public speaker in the society of Friends,⁽⁴⁶⁾ attended her in her last illness, at her particular request;—and, added Mr. Rittenhouse, “the same worthy gentleman who visited her in her sickness, delivered an excellent exhortation at the grave,—giving, in a few words, a very just character, I think, of our deceased sister.”

Mr. Shoemaker (who married again) had an only child named Jacob, by his first wife here mentioned. This son became a young man of promising character : but, having entered the American army at the commencement of the revolutionary war, and attained (it is believed) the rank of captain, under the patronage of his uncle David Rittenhouse, he was slain in the campaign of 1781, in South-Carolina. Mr. Rittenhouse was much afflicted by the death of this gallant young man, who fell in the flower of his age.

An occasion presented itself, in which Mr. Rittenhouse, when only in the thirty-second year of his age, was employed in transacting an important piece of business of a *public* nature : it was as follows.

(46) Mr. Stanton died at Philadelphia, the 28th of June, 1770, aged sixty-two years. He was, for above forty years, a distinguished preacher among the people called Quakers; and is reputed to have been a man, “who, from his youth, had been a conspicuous example of Christian meekness, humility, and self-denial; a zealous promoter of the cause of religion, and the essential good of mankind.”

Some elegiac verses, under the title of a “poetic tribute” to the memory of this worthy man,—from the pen of a lady in Philadelphia,—were published in the *Port Folio*, for April 1813.

In consequence of a petition of the Messrs. Penn to the court of chancery in England, exhibited in the year 1735, it was decreed by the lord chancellor, in 1750,—That an agreement which had been entered into between the Penns and Lord Baltimore, concerning the long-subsisting controversy relative to the boundary lines between Pennsylvania and Maryland, should be carried into specific execution : and, accordingly, a final agreement was executed by those proprietaries of the two provinces, on the fourth day July, 1760.

In pursuance of the chancellor's decree, provision was made for ascertaining and fixing the "circle," to be "drawn at twelve miles distance from Newcastle, northward and westward, unto the beginning of the fortieth degree of north latitude;"—and thence, running a straight line westward, five degrees in longitude, to be computed from the eastern boundary; as described in the royal charter to William Penn. Commissioners were appointed under the chancery-degree, for settling these boundaries. But nothing was definitively done in the business, until the eleventh of January, 1769; when the line which was run by Messrs. Mason and Dixon in the years 1767 and 1768, in pursuance of the final agreement between the parties before mentioned, was approved and ratified by the king in council.

So early, however, as about the close of the year 1763, four or five years before the running and marking of Mason and Dixon's line, Mr. Rittenhouse was employed by the Penn family in making some geographical arrangements, preparatory to the final establishment of those boundaries. He was engaged to perform this service, by the Rev. Mr. Richard Peters, (afterwards D. D. and rector of the united churches of Christ-Church and St. Peters, in Philadelphia,) who then officiated as the Governor's provincial secretary; a gentleman of learning and great worth; and one who, on various occasions, manifested a friendship for Mr. Rittenhouse, as well the high opinion he entertained of his abilities.

The particular department of that business thus committed to Mr. Rittenhouse, seems to have been the fixing of *the Circle*,—or at least, the tracing of its course or route, topographically; and this was, certainly, a matter of no little difficulty. That this service was performed to the satisfaction of the then administrators of the government of Pennsylvania, and that it was an arduous one, will appear by the following extract of a letter from Mr. Rittenhouse to the Rev. Mr. Barton, dated the sixteenth of February, 1764.⁽⁴⁷⁾

(47) This letter contains, likewise, a short narrative of an occurrence which excited much feeling, and claimed a considerable portion of the public attention, at the time. As Mr. Rittenhouse's account of the transaction referred to, will serve to shew

“I hope,” said he, “you will never believe that I am determined to disclaim all kind of intercourse” with

that he was not an indifferent spectator of the political events of that early day; and, further, that he was zealously disposed to support the legitimate authority of the government, in order to suppress illegal and disorderly proceedings, subversive of the laws and dangerous to the public peace and safety; this part of his letter to Mr. Barton (of the 16th of February, 1764,) is also presented to the reader.

It will be recollected that what was called the *Paxton Riot* in Pennsylvania, in the year 1763, was occasioned by an attempt made by many of the inhabitants of a district in the upper end of Lancaster (now Dauphin) county, called Paxton, with some of their neighbours, to destroy a number of Indians resident in and near that county; who were extremely obnoxious to the Paxton people, by reason of the supposed treachery, if not actual hostility, of these Indians to the settlers on the Paxton frontier, in the war that had then recently terminated. These unfortunate Indians had, nevertheless, uniformly professed themselves to be friendly to the English, in that war; and were so reputed by the government of Pennsylvania: but finding themselves, notwithstanding, threatened with extermination by “*the Paxton Boys*” (as they were then called,)—by whom a few old men, women, and children had been destroyed, shortly before, at their homes,—they sought the protection of the government. Part of them were, accordingly, placed in the public prison in Lancaster, and the remainder at the barracks in Philadelphia, as places of security. Those in Lancaster, to the number of fourteen or fifteen, were soon after, as is well known, killed by the Paxton people, one of the prison doors having been forcibly broken open by them. The remnant of these persecuted Indians, who were in Philadelphia, were more fortunate than their brethren; they escaped the horrors of assassination: And it is to the expedition against these wretched fugitives—a mere handful of men, unarmed, and claiming from Christians an asylum from massacre,—that Mr. Rittenhouse refers in his letter.

“You are no doubt, long before this time, well acquainted,” said our young philosopher, “with every particular of the Paxtonian expedition to Philadelphia: nor need I tell you, that what-

you : for I can say with the greatest sincerity there are very few things I so much regret, as that I have it

ever information you may have through the channel of ———, will be abominably corrupt. About fifty of the scoundrels marched by my work-shop—I have seen hundreds of Indians travelling the country, and can with truth affirm, that the behaviour of these fellows was ten times more savage and brutal than theirs. Frightening women, by running the muzzles of their guns through windows, swearing and hallooing; attacking men without the least provocation; dragging them by the hair to the ground, and pretending to scalp them; shooting a number of dogs and fowls;—these are some of their exploits.

“I received a letter from sister E. soon after the alarm at Philadelphia was over, and will give you a part of it, which I doubt not will be agreeable to you.”—It is as follows.

—“On Monday morning between one and two o’clock, an express came to the governor, informing that the rebels were on their way, and that a great number of them were on this side the White Horse. There was one express after another, till there was certain intelligence that some of them were at Germantown. When the first express came, the bells were rung, the drums beat, and the constables were ordered to go from house to house, to knock up the inhabitants, and to bid them put candles at their doors : it had the appearance of all the houses being illuminated. Before day, there were above twenty men met at J. J.’s, and chose their officers. Before night they were increased to nearly an hundred; as were likewise most of the other companies : E—— and all our men were in captain Wood’s company. They all appeared to be in high spirits, and desirous to meet the rebels. On Tuesday, when the mayor and the other gentlemen set off for Germantown, the heads of the companies begged of them not to comply with any dishonourable terms, and told them—“Gentlemen, we are ready to go wherever you may command us; and we had much rather you would let us treat with them (the rebels) with our guns.”—On their return, there was a general murmur among the companies against the proceedings of our great men; they knew it, and there was a long harangue made by Mr. Chew : but it did not answer the end.

not in my power to spend a great part of my time with you. My attention has, for some time past, been en-

On Wednesday morning I went to —, as usual; and on my return home, I stopped at our friend H. J.'s; when, on a sudden, the alarm-gun was fired, the bells began to ring, and the men called "*to arms*," as loud as possible. I cannot describe, my dear brother, how I felt: we ran to the door, when to add to my fright, I saw E—, amidst hundreds of others, run by with his gun. They met at the court-house, formed themselves into regular companies, and marched up Second-street as far as the barracks; when they found it was a false alarm.

"It was a pleasing, though melancholy sight, to view the activity of our men. In less than a quarter of an hour, they were all on their march,—it is supposed above a thousand of them; and by all accounts, there were not ten — among them. It was the common cry, while our men were parading—"What! not *one* — among us!"—Instead of joining with others, they would sneak into corners, and applaud the "Paxton-boys." Their behaviour on this occasion has made them appear blacker than ever."

Concerning these extraordinary transactions, to which much importance was attached in their day, and which, moreover, constitute a curious and interesting occurrence in the history of Pennsylvania, in the time of our philosopher, the testimony of another respectable witness is added; a person, besides, who bore a principal part in arresting the progress of the insurrection referred to. On the 2d of June, 1765, Dr. Franklin, who was then in London, wrote a letter to the celebrated Henry Home, lord Kames, in which the following interesting circumstances are related, respecting what was called the Paxton Expedition: this letter is inserted entire in lord Woolhousie's *Memoirs of the Life and Writings of Lord Kames*. The Doctor therein says—"In December (1763,) we had two insurrections of the back inhabitants of our province, by whom twenty poor Indians were murdered, that had from the first settlement of the province lived among us, under the protection of our government. This gave me a good deal of employment; for, as the rioters threatened further mischief, and their actions seemed to be approved by

gaged with such a multiplicity of things, that I may with some reason claim your indulgence for my not writing. Have I not, indeed, an equal right to complain?—for, I think this letter will balance our accounts, from the time I last saw you.

“I waited on Mr. Peters, as you desired me to do. He treated me kindly, and made an offer of doing me some services; for which I am greatly obliged to him. He likewise paid me for my attendance at New-Castle, and much more generously than I expected;—though I found it a very laborious affair; being obliged, singly, to go through a number of tedious and intricate calculations.”

an increasing party, I wrote a pamphlet, entitled *A Narrative*, &c. to strengthen the hands of our weak government, by rendering the proceedings of the rioters unpopular and odious. This had a good effect: and afterwards, when a great body of them with arms marched towards the capital in defiance of the government, with an avowed resolution to put to death one hundred and forty Indian converts, then under its protection, I formed an association at the governor's request, for his and their defence, we having no militia. Near one thousand of the citizens accordingly took arms: Governor Penn made my house for some time his head-quarters, and did every thing by my advice; so that, for about forty-eight hours, I was a very great man, as I had been once some years before, in a time of public danger. But the fighting face we put on, and the reasonings we used with the insurgents, (for I went, at the request of the governor and council, with three others, to meet and discourse them,) having turned them back, and restored quiet to the city, I became a less man than ever; for I had, by these transactions, made myself many enemies among the populace.”

It appears that about this time, Mr. Rittenhouse's friends had some beneficial object in view for him; perhaps some official situation, which they conceived to be adapted to the nature of his pursuits, and such as might more permanently promote his interests. But whatever that object may have been, he seems to have hesitated about it. If it were a public appointment of a permanent kind, it would probably have required his removal to the city,—a measure which he did not contemplate at that time; and he might, besides, have been disinclined to undertake any official duties, which would be likely to occupy the greater part of his time. He expressed himself thus to Mr. Barton, on the subject, in the letter just quoted:—"I am greatly obliged to you, my dear brother, for pointing out any prospect of advantage to me: I shall consider the matter you mention in your last, and let you know my opinion. The objections you have so well answered, are those which would most readily occur to me. Considering the crazy state of my constitution, a retired life would certainly suit me best. Since death, to use John Bunyan's ⁽⁴⁸⁾ phrase,

(48) The writer of these memoirs well remembers to have heard Mr. Rittenhouse, when fully matured in years, speak of the pleasure he derived from the reading of John Bunyan's *Pilgrim's Progress*, while a youth. It is, certainly, no faint compliment to the "well-told tale" of that "ingenious dreamer," that it engaged the attention of David Rittenhouse, even at a very early period of his life: and that compliment is greatly enhanced by the following beautiful invocation, addressed to the long-since departed spirit of the humble, yet persecuted, the pious, yet fanciful Bunyan, by the amiable Cowper:—

does usually knock at my door once a day, would it not be a folly for me to take up the load of any public business?"

About three years afterwards, Mr. Rittenhouse seemed to have been less indisposed to accept of an official situation: and, such was his high standing with the government and its most influential friends, there can be very little doubt he could have obtained a respectable one. It is evident that, at this latter period, when perhaps his health was improved, he

“ Oh thou, whom, borne on fancy’s eager wing,
Back to the season of life’s happy spring,
I pleas’d remember, and, while mem’ry yet
Holds fast her office here, can ne’er forget ;
Ingenious dreamer, in whose well-told tale
Sweet fiction and sweet truth alike prevail ;
Whose hum’rous vein, strong sense, and simple style,
Witty, and well-employ’d, and, like thy Lord,
Speaking in parables his slighted word ;
I name thee not, lest so despis’d a name
Should move a sneer at thy deserved fame :
Yet, ev’n in transitory life’s late day,
That mingles all my brown with sober gray,
Revere the man, whose PILGRIM marks the road,
And guides the PROGRESS of the soul to God.”

Cowper’s *Tirocinium*.

The celebrated Benjamin Franklin too, in the account of his Life written by himself, informs us, that the *Pilgrim’s Progress* (which Franklin there, inadvertently, calls “*Bunyan’s Voyages*,”) was a favourite book of his, in his earlier years. “I have since learned,” says the Doctor, “that it has been translated into almost all the languages of Europe; and, next to the Bible, I am persuaded, it is one of the books which has had the greatest spread.”

had some particular office in view : because, by a letter to Mr. Barton, dated January 28th 1767, he said—"I am entirely satisfied with your proceedings in the affair I recommended to you; and I shall wait on Mr. Peters. The reputation of the office would be very agreeable to me; but the execution of it would, I am afraid, greatly interfere with the other projects you have so much insisted on."

Mr. Rittenhouse continued a bachelor until the 20th of February, 1766, when he married Eleanor Colston, daughter of Bernard Colston, a reputable farmer in the neighbourhood. This person belonged to the religious society called Quakers; Mr. Rittenhouse was not himself a member of any particular church: but the marriage was solemnized at Norriton, by the Rev. Mr. Barton, who went thither for the purpose at his brother-in-law's request:

Some time prior to this event, old Mr. Rittenhouse, having previously made his son David the proprietor of the Norriton farm, removed with his family to the house he had built⁽⁴⁹⁾ on his place in Worcester township, already mentioned; while the son's family occupied the old place of residence: and here our Astronomer remained about four years after his marriage. It was during this period, that his reputation as an

(49) This was about the year 1764.

astronomer became eminently conspicuous;⁽⁵⁰⁾ his name acquired a celebrity even in the old world, of which his early but now much increased fame, in his native country, was a sure presage.⁽⁵¹⁾

(50) In the earlier part of this interval of time, and before he became more seriously engaged in those great works and researches, the construction of his Orrery, and the Observation of the Transit of Venus with the operations preparatory to it, which about that time engrossed his attention, he occasionally amused himself with matters rather speculative than practical: though he very seldom devoted any considerable portion of his time to things which he did not consider as being in some degree useful.

The following is one of those instances in which his active mind was diverted from severer studies, to some objects of a more playful nature.

In the year 1767, some ingenious country-gentleman published in Messrs. Hall and Sellers's paper, under the signature of T. T. the result of calculations he had made on Archimedes's famous vaunting assertion, *Δος μου στω, και την γην κινησω*. Mr. Rittenhouse published, some short time after, calculations (or rather the result of calculations) of his own, on the same problem. This appeared in a piece under the signature of "*A Mechanic*," dated the 8th of October, 1767: and a reply to it, by T. T. dated October the 29th, appeared in the same paper. These little speculations will be found in the Appendix. It is not improbable that Mr. Rittenhouse, under the disguise of "*A Mechanic*," appeared in print on this occasion, for the purpose of drawing the attention of ingenious men to subjects of this nature.

(51) It was between the years 1766 and 1770—the interval of time above mentioned,—that the two important circumstances occurred, which gave great celebrity to the reputation of Mr. Rittenhouse, as an astronomer: these were the Construction of the Orrery invented by him, and the admirable result of his observations of the Transit of Venus, as published in the Philosophical Society's Transactions.

About the time that he projected his Orrery (which shall be duly noticed in its place), it appears he had been speculating on the doctrine of the compressibility of water. For in a letter to Mr. Barton, dated from Philadelphia the 27th of March, 1767, he mentions,—that he had not then met with any person, who had seen Mr. Kinnersley's⁽⁵²⁾ experiment on that theory;

Amidst those objects of importance in which he was principally occupied, he occasionally amused himself with matters of minor consequence. Among other things, he contrived and made, in the beginning of the year 1767, an ingeniously contrived thermometer, constructed on the principle of the expansion and contraction of metals, by heat and cold, respectively. This instrument had, under glass, a face upon which was a graduated semi-circle: the degrees of heat and cold corresponded with those of Fahrenheit's thermometer; and these were also correspondently designated, by an index, moving on the centre of the arch. Its square (or rather parallelogramical) form, its flatness and thinness, and its small size—together with its not being liable to the least sensible injury or irregularity, from any position in which it might be placed,—rendered it safely portable; insomuch, that it could be conveniently carried in the pocket.

He presented one of these metaline Thermometers to Dr. Peters, in June 1767: Another, which he made for himself, was a considerable time in the hands of Mr. Barton, at Lancaster. They were found to agree very well with Fahrenheit's. In a letter to Mr. Barton, dated the 26th of July 1769, he said—"You will oblige me by sending the metaline thermometer by ***, and let me know the greatest height you have seen it, this season. Fahrenheit's thermometer, in my Observatory, not exposed to the sunshine but very open to the air, was $94\frac{1}{2}^{\circ}$ on the 5th of this month, at 3 in the afternoon; which is the highest I have ever seen it."

(52) The Rev. Ebenezer Kinnersley, A. M. Professor of English and Oratory in the college of Philadelphia. This vener-

but that he understood it was made with the air-pump, and conjectured it to have been similar to the one made by a member of the Royal Society, related in *Martin's Magazine* : which is thus quoted in *Mr. Rittenhouse's* letter :

“ I took a glass ball of about an inch and $\frac{1}{8}$ in diameter, which was joined to a cylindrical tube of 4 inches and $\frac{1}{8}$ in length, and in diameter $\frac{1}{16}$ of an inch ; and by weighing the quantity of mercury that exactly filled the ball, and also the quantity that filled the tube, I found that the mercury in $\frac{1}{16}$ of an inch of the tube was the 10000th part of that contained in the ball ; and with the edge of a file, I divided the tube accordingly. This having been done, I filled the ball and part of the tube with water exhausted of air : Now, by placing this ball and tube under the receiver of an air-pump, I could see the degree of expansion of the water, answering to any degree of rarefaction of the air ; and by putting it into a glass receiver of a condensing engine, I could see the degree of compression of the water, answering to any degree of condensation of the air, &c.”—Then adds *Mr. Rittenhouse*—“ Indeed I do not doubt the compressibility of water, although the above experiment does

able and worthy man, who was a clergyman of the Baptist church, was a very eminent Electrician. In this branch of philosophy, he was an able lecturer and ingenious experimentalist : and perhaps to no person—at least in America,—were his cotemporaries more indebted, than to him, for the light which he shed, at a very early day, on this interesting and pleasing science.

not much please me. If the particles of water were in actual contact, it would be difficult to conceive how any body could much exceed it in specific gravity; yet we find that gold does, more than eighteen times."

The first academic honour conferred upon our philosopher, was on the 17th of November, 1767; when the College of Philadelphia, then in its meridian splendour, bestowed on him an honorary degree of Master of Arts. Mr. Rittenhouse being present at the commencement then held, the provost, in conferring this degree, thus addressed him,—in terms of a just and well merited compliment :

"Sir,—The trustees of this College (the faculty of professors cheerfully concurring), being ever desirous to distinguish real merit, especially in the natives of this province,—and well-assured of the extraordinary progress and improvement which you have made, by a felicity of natural genius, in mechanics, mathematics, astronomy, and other liberal arts and sciences, all which you have adorned by singular modesty and irreproachable morals,—have authorized and required me to admit you to the honorary degree of Master of Arts, in this seminary : I do therefore, by virtue of this authority, most cheerfully admit, &c."

Mr. Rittenhouse's great abilities, as an astronomer and mathematician, being now every where known,

he was employed in the year 1769, in settling the limits between the provinces of New-York and New-Jersey. The original grant of all the territory, called by the Dutch *New-Netherlands* (sometimes *Nova-Belgia*), was made by King Charles II. to James Duke of York, on the 12th of March, 1662-4; and on the 24th of June following, the Duke granted that part of it, now called New-Jersey, to the Lord Berkeley of Stratton and Sir George Carteret, jointly: The Dutch reduced the country, in the year 1672; but it was restored by the peace of Westminster, February the 9th, 1672-4. On the 29th of June, in the same year, a new patent was issued to the Duke of York, for the lands comprised within the limits described in the former patent. On the 28th of the succeeding July, the colony of New-Jersey was divided into East and West-Jersey (hence, generally called the Jersies); and the former was then granted, by the Duke of York, to Sir George Carteret. In 1675, West-Jersey, being Lord Berkeley's moiety of the province, was sold to John Fenwick, in trust for Edward Bylinge; who assigned his interest therein to William Penn and others,⁽⁵³⁾ in trust, for the use

(53) According to the American historian, Marshall, Lord Berkeley assigned his interest in the Jersies to Penn and his three associates, in the year 1674; and they, soon perceiving the inconvenience of a joint property, divided the province, in 1676, with Carteret, who still retained his interest: to him they released East-Jersey; and received from him, in return, a conveyance for the western part of the province. The Duke of York resigned the government of East Jersey to the proprietor,

of his creditors. This partition was confirmed in the year 1719, by the general assembly of the Jersies. But prior to this confirmation, viz. the 10th of October, 1678, a new grant of West-Jersey was made by the Duke of York, to the assigns of Lord Berkeley; and on the 1st of February, 1681-2, East-Jersey was sold and conveyed, in pursuance of Sir George Carteret's will, to twelve persons; who, by separate deeds, conveyed one-half of their several interests in the same to twelve other persons: and, on the 14th of the next month, the Duke of York made a new grant of East-Jersey to those twenty-four proprietors, thereby confirming the same to them. The proprietors of both the Jersies afterwards became very numerous, by purchase as well as by descent. This being attended with great inconveniencies, they finally surrendered the government to the crown, on the 17th of April, 1702: and from that time, the province of New-Jersey continued to be a royal government, until the American revolution.

retaining that of West-Jersey as an appendage to New-York, until August 1680; when, on a reference to Sir William Jones, the title was decided against the Duke: after which, he formally released all claim upon East-Jersey. Soon after this, Carteret transferred his rights to Penn, and eleven other persons of the same religious persuasion, who immediately conveyed one half of their interest to James Drummond, Earl of Perth, and eleven others; and these, in March 1683, obtained a conveyance from the Duke of York directly to themselves.—During these transactions, continual efforts were made to re-annex the Jerseys to the province of New-York. [See Marshall's *Introduction to the Life of Washington*, ch. vi.]

The division-line, between East and West-Jersey was to run from the-south-east point of Little Harbour, on Barnegate Creek—being about mid-way between Cape-May and Sandy-Hook, to a creek a little below Ancocus-Creek, on the river Delaware, thence, about thirty-five miles in a straight course along the Delaware, up to $41^{\circ} 40'$ of north latitude.

The province of New-York passed a legislative act on this subject, in the year 1762; and the New-Jersey Assembly enacted a corresponding law in 1764. Five commissioners—namely, John Stevens, James Parker, Henry Cuyler, William Donaldson and Walter Rutherford—were appointed on this business, for the two provinces : their report was passed upon, by both; and it was confirmed by the King in council, the 1st of September, 1773. It is understood, that the division-line between East and West-Jersey remained unsettled, so late as the year 1780. But it nevertheless appears, that the territorial boundary between New-York and New-Jersey was fixed by Mr. Rittenhouse, forty-four years ago.

A recurrence shall now be had to a date anterior to our Philosopher's employment in the transaction just mentioned.—Within the two years preceding that period, two objects of much importance to astronomical science, claimed a large share of the public attention, in this country : One of them, especially, had already actually engaged the investigations of the

ablest astronomers of the other hemisphere, as well as our own; preparatory to the then approaching event, to which those researches were directed. The result of the expectations excited by both of those objects proved, on their final completion, highly honourable to the fame of Mr. Rittenhouse.

The first of these, in the order of time, was our Astronomer's newly-projected Orrery; a general but concise description of which, was communicated by his friend, the Rev. Dr. Smith, to the Philosophical Society, on the 21st of March, 1768. Of this fine and eminently useful piece of mechanism, more particular mention shall be made in the sequel.

The other circumstance, just referred to, was the then approaching Transit of Venus over the Sun's disk; an event which was to take place on the 3d day of June, 1769: And of Mr. Rittenhouse's participation in the arduous labours of the astronomical world, on that very interesting occasion, the following narrative will furnish some account.

The American Philosophical Society, in their meeting on the 7th of January, 1769, had appointed the following gentlemen to observe that *rare phaenomenon*,⁽⁵⁴⁾ as it was aptly styled by Dr. Smith; namely,

(54) There will not be another transit of Venus over the Sun's disk, until the 8th of December, 1874; which, it is probable

the Rev. Mr. (afterwards Dr.) John Ewing, Mr. Thomas Prior, Joseph Shippen, jun. Esq. Hugh Williamson, M. D. the Rev. Dr. Smith, Mr. David Rittenhouse, John Lukens, Esq. and Messrs. James Alexander, Owen Biddle, James Pearson, John Sellers, Charles Thomson, and William Poole. The gentlemen thus nominated were distributed into three committees, for the purpose of making separate observations at three several places; these were, the city of Philadelphia, Mr. Rittenhouse's residence, in Norriton, and the Light-House near Cape Henlopen, on Delaware Bay. Dr. Ewing, an able mathematician and very respectable astronomer, had the principal direction of the Observatory in the City, which was erected on this occasion in the State-house Gardens; and Mr. O. Biddle, a person of much ingenuity, had the charge of superintending the observations at Cape Henlopen. Associated with Mr. Rittenhouse, on the Norriton committee, were the Rev. Dr. Smith, provost of the College of Philadelphia, well known as an astronomer and eminently skilled in the mathematics; Mr. Lukens, then surveyor-gene-

few persons now living will have an opportunity of observing, astronomically: And from that time, down to the 14th of June, A. D. 2984, inclusively,—a period of upwards of eleven centuries,—the same planet will pass over the Sun only eighteen times. There will be one other such transit of this planet, within the present century; after which there will not be another, during the term of one hundred and twenty-one years and an half. [See Table of the Transits of Venus over the Sun, in Lalande's *Astronomie*; vol. ii.]

ral of Pennsylvania, who possessed considerable abilities in the same departments of science; and Mr. Sellers, a respectable member of the provincial legislature, for the county of Chester. The Rev. Mr. Barton, with some other gentlemen of ingenuity and talents, voluntarily attended at Norriton, on this occasion; and rendered such assistance as they could, to the committee.

As the time approached near, when this extraordinary and almost unprecedented⁽⁵⁵⁾ astronomical phenomenon was to manifest itself, the public expectation and anxiety, which were before considerable, became greatly heightened. The ignorant—and those, generally, unacquainted with the nature of the looked-for event,—hearing much every where said on the subject, and seeing the preparations making for the occasion, had their curiosity wonderfully excited. To scientific men, the inestimable value of the approaching phenomenon suggested very different sensations. “Its importance to the interests of Astronomy and Navigation, had,” as Dr. Ewing observed at the time, “justly drawn the attention of every civilized nation in the world.” An accurate ascer-

(55) There had been but one of these transits of Venus over the Sun, during the course of about one hundred and thirty years preceding the transit of 1769; and, for upwards of seven centuries, antecedently to the commencement of that period, the same planet had passed over the Sun's disk no more than thirteen times. [See Lalande's Table, before referred to.]

tainment of the Sun's Parallax,—an important and fundamental article in Astronomy, was a *desideratum* not yet obtained. Only two Transits of Venus over the Sun, had been *observed*, prior to the 3d of June, 1769, since the creation of the world; and of these, the first alone was seen but by two persons:⁽⁵⁶⁾ Yet, as the learned gentleman just quoted has remarked,—“the Transits of Venus, alone, afford an opportunity of determining this problem” (the settling the Parallax of the Sun,) “with sufficient certainty: and these, he adds, “happen so seldom, that there cannot be more than two in one century, and in some centuries none at all.”

To an object, then, of such vast importance to science, were proportioned the expectations of our Observers. But they could not fail to experience, at the same time, in common with their astronomical brethren in other parts of the world, a large portion of anxious apprehensions, lest a cloudy day—nay, even a solitary passing cloud,—should baffle entirely their exalted hopes, and destroy all the fruits of their arduous labours! Yet such an occurrence, as one or the other of these events, was evidently within the calculations of a probable incident.

Mr. Rittenhouse participated largely in these blended hopes and fears. He had, for some time before,

(56) Jeremiah Horrox and William Crabtree, two Englishmen, were the observers of the Transit of Venus of 1639.

been laboriously employed in making the requisite preparatory observations and calculations: and, as Norriton was now rendered eminently conspicuous, by being fixed on as a principal site for observing the very interesting phenomenon so near at hand, he had been assiduously engaged, at the same time, in preparing and furnishing an Observatory at that place, suitable for the occasion. This he began to erect early in November, 1768,—“agreeably,” to use his own words, “to the resolutions of the American Philosophical Society;” but, through various disappointments from workmen and weather, he was not enabled to complete it till the middle of April, 1769.⁽⁵⁷⁾

(57) It was not until the year 1786, that Mr. Rittenhouse built the house at the north-west corner of Arch and (Delaware) Seventh streets, in Philadelphia, where he resided during the remainder of his life: but probably it was some few years earlier that he erected his Observatory, a small but pretty convenient octagonal building, of brick, in the garden adjacent to his dwelling-house. Its situation was not an ineligible one, when the building was first put up: but its commodiousness and utility were probably much diminished, by the erection, not long afterwards, of some large houses near it; and it is presumable, that its usefulness in any degree, for the purposes of an Observatory, could have continued but a little while beyond the duration of its late proprietor's life, by reason of the rapid increase of the number of lofty houses in the vicinity. Indeed it lately became extremely probable, on considering the great enlargement of Philadelphia within the last twenty-five years, that the future augmentation of the population and extension of improvements in this beautiful and hitherto flourishing city, would, in a very few years, render the late Observatory of Mr. Rittenhouse wholly useless for astronomical purposes; and, in the event of the

The Norriton Observatory was commodiously situated near Mr. Rittenhouse's mansion, on a pretty elevated piece of ground, commanding a good range of horizontal view. This temporary edifice was as well adapted to the purpose for which it was chiefly designed, as the nature of the materials of which it was constructed, and other circumstances, would permit. Some monies had been previously appropriated by the Philosophical Society, towards defraying the expenses necessarily incident to this occasion, at the three several places of observation : but the funds of the society, at their disposal for such purposes, were very limited ; and it is believed that the quota of those funds assigned for the expenditures actually incurred for making the observations of the transit, at Norriton, was quite inconsiderable in its amount.

In order that ample justice may be done to the merits of Mr. Rittenhouse, for all the preparatory arrangements made by him on this occasion, the reader

surrounding ground and adjacent buildings being alienated from his family, improper for any other.

This was the Observatory noticed by Mr. Lalande, when (in his *Astronomic*, published in 1792,) he made this remark, treating of the numerous Observatories in different parts of the world—“In America, I know of no Observatory but that of Mr. Rittenhouse at Philadelphia.”

The Observatory at Norriton, mentioned in the text, was a temporary erection ; and was disused on his removal to Philadelphia, soon after. The one put up in the State-House Gardens in that city on the same occasion, was likewise a temporary edifice, constructed of wood.

is here presented with an extract from Dr. Smith's subsequent Report, to the Philosophical Society, of the proceedings of the Norriton Committee, and made in their behalf.—“I am persuaded” says the doctor, “that the dependance which the learned world may place on any particular 'Transit-Account, will be in proportion to the previous and subsequent care, which is found to have been taken in a series of accurate and well conducted observations, for ascertaining the *going* of the time-pieces, and fixing the latitude and longitude of the place of observations, &c. And I am the more desirous to be particular in these points, in order to do justice to Mr. RITTENHOUSE, one of the committee; to whose extraordinary skill and diligence is owing whatever advantage may be derived, in these respects, to our observation of the Transit itself.”—“Our great discouragement at our first appointment,” continues the learned reporter, “was the want of proper apparatus, especially good Telescopes with Micrometers. The generosity of our Provincial Assembly soon removed a great part of this discouragement, not only by their vote to purchase one of the best reflecting Telescopes, with a *Dollond's* micrometer;⁽⁵⁸⁾ but likewise

(58) On an address of the Philosophical Society to the general assembly, dated the 15th of October, 1768, the latter “Resolved, That a sum, not exceeding one hundred pounds sterling, be provided and appropriated for purchasing a reflecting telescope with a micrometer, for the purpose mentioned in the said address” (observing the Transit of Venus, then near at hand,) “and, afterwards, for the use of the house; and that the speaker do

by their subsequent donation of one hundred pounds," (this was in sterling money, = \$444) "for erecting Observatories and defraying other incidental expences."⁽⁵⁹⁾

It was foreseen, that on the arrival of the Telescope, added to such private ones as might be procured in the city, together with fitting up the instruments belonging to the honourable the Proprietaries of the province—viz. the equal Altitude and Transit Instruments and the large astronomical Sector,—nothing would be wanted for the city Observatory in the State-House Square, but a good Time-piece, which was easily to be procured. We remained, however, still at a loss, how to furnish the Norriton Observatory:⁽⁶⁰⁾ But even this difficulty gradually vanished."

write to Benjamin Franklin, Esq. in London, to purchase the same."

(59) On a similar address of the Philosophical Society, dated the 7th of February, 1769, the assembly granted them one hundred pounds, "to be laid out towards defraying the expenses necessary for observing the (then) ensuing Transit of Venus." This grant was made on the 11th of February, 1769.

But the sum then granted proving very inadequate to the object, the society petitioned the assembly on the 11th of February, 1773; stating, that the erecting the different observatories, fitting up instruments, engraving various plates, and publishing the different transit papers alone, cost the society near 400*l.* and praying assistance to discharge that debt.

(60) Mr. Lalande, in the preface to his *Astronomie* (3d edit. 1792,) mentions, that he did not then know of any other observatory in America than that of Mr. Rittenhouse.

Thus it appears, that while the public contributions, and such astronomical instruments suitable for the occasion as were the public property, were principally at the disposal of the Philadelphia committee, the Observatory at Norriton—which seems to have been considered as a private establishment, belonging to an individual,—depended almost entirely on other resources. Even an excellent reflecting telescope (though without a micrometer,) the property of the Library Company of Philadelphia, and to which institution it was a donation from the Hon. T. Penn,—the same that had been used by Messrs. Macon and Dixon, when employed in settling the boundary lines of Pennsylvania and Maryland—was necessarily appropriated to the use of Mr. Owen Biddle, who was appointed by the Society to conduct the Observation of the Transit, near Cape Henlopen.

The Norriton Observatory was, notwithstanding, at last completely furnished with every instrument proper for the occasion. In consequence of some previous communications made by Dr. Smith to the Hon. Mr. T. Penn of London, and to the Rev. Mr. Maskelyne, the British astronomer-royal at Greenwich, the former worthy and liberal gentleman had sent, for the use of the Norriton committee, a reflecting Telescope with Dollond's Micrometer—such as the doctor had expressed a wish to obtain; and requested, that after the committee should have made their observations with it, it should be presented in his name to the

College.⁽⁶¹⁾ Through the means of Dr. Smith, likewise, an astronomical quadrant of two and an half feet radius, made by Sisson, the property of the East-Jersey proprietaries, was procured by Mr. Lukens from the Earl of Stirling, surveyor-general of that province. This had been pretty early sent up by Mr. Lukens to Mr. Rittenhouse, and was used by him in ascertaining the latitude of his Observatory.

In addition to these and some other apparatus used at Norriton on the occasion—a catalogue and description of the whole of which, are contained in Dr. Smith's before-mentioned report—the zeal, industry, and talents of Mr. Rittenhouse enabled him to furnish his Observatory with the three following described instruments, made by himself,⁽⁶²⁾ as described by Dr. Smith.

(61) This was one instance among many of the munificence of Mr. Penn to the College of Philadelphia, and of his zealous wish to promote the interests of science in Pennsylvania. The trustees of the college say, in a letter written to Mr. Penn the 1st of August, 1769, thanking him for his donation of the fine instrument above mentioned, together with a pair of “Adams's new-invented Globes;” “We have likewise the pleasure to acknowledge a fresh instance of your benevolence, in sending us a chemical apparatus under the care of Dr. Rush.” “The many great and valuable favours this College has received at your hands, have always been conferred in a manner which has rendered them peculiarly acceptable; and cannot fail to leave the most lasting impressions of gratitude and esteem in the heart of every person concerned in the institution.”

(62) Mr. Lalande (in his *Astronomie*) has been careful to mention, that the celebrated astronomer Hevelius possessed a similar

1. An *Equal Altitude Instrument*—its telescope three and an half feet focal length, with two horizontal hairs, and a vertical one in its focus ; firmly supported on a stone pedestal, and easily adjusted to a plummet-wire four feet in length, by two screws, one moving in a North and South, the other in an East and West direction.

2. A *Transit Telescope*, fixed in the meridian, on fine steel points ; so that the hair in its focus could move in no other direction than along the meridian ; in which were two marks, South and North, about 330 yards distance each ; to which it could be readily adjusted in an horizontal position by one screw, as it could in a vertical position, by another.

3. An excellent *Time-piece*—having for its pendulum-rod a flat steel bar, with a bob weighing about twelve pounds, and vibrating in a small arch. This went eight days, did not stop when wound up, beat

merit. He constructed, himself, the very large telescopes and other instruments, described (with plates) in his great work entitled, *Machina Cœlestis*, and with which he furnished the Observatory that he established at his own residence, in the year 1641. Hevelius (whose true name was John Hoelké.) was the son of a brewer ; but was well educated. He was born at Dantzic the 28th of January, 1611 : and after having made the tour of England, France and Germany, from 1630 to 1634, he was, on his return to his native city, occupied for some time in the affairs of that little republic ; of which he officiated as consul, in 1651. He died on the anniversary of his birth-day, at the age of seventy-six years.

dead seconds, and was kept in motion by a weight of five pounds.⁽⁶³⁾

Thus was the Norriton Observatory furnished with all the more immediately necessary apparatus, in readiness for the important event which was the main object of these arduous exertions. Much credit was due to Dr. Smith, much to Mr. Lukens and the other gentlemen engaged on this occasion, for the assistance which he, and they, afforded Mr. Rittenhouse. Yet the doctor himself very candidly says—in reporting the proceedings of the Norriton committee to the Philosophical Society,—“other engagements did not permit Mr. Lukens or myself to pay much attention to the necessary preparations ; but we knew that we had entrusted them to a gentleman on the spot, who had joined to a complete skill in *mechanics*, so extensive an *astronomical* and *mathematical* knowledge, that the use, management, and even the construction of the necessary apparatus, were perfectly familiar to him. Mr. Lukens and myself could not set out for his house till Thursday, June 1st ; but, on our arrival there, we found every preparation so forward, that we had little to do, but to adjust our respective telescopes to distinct vision. He had fitted up the different instruments, and made a great number of observations, to ascertain the going of his Time-piece, and to determine the latitude and longitude of his Observatory. The laud-

(63) For some of the reasons which induced the writer to describe the instruments used on that occasion, see Note 71.

able pains he hath taken in these material articles," continues Dr. Smith in his report, "will best appear from *the work itself*,—which he hath committed into my hands, with the following modest introduction; giving me a liberty, which his own accuracy, care and abilities, leave no room to exercise."⁽⁶⁴⁾

(64) In addition to this publicly declared testimony of Dr. Smith, to the merits of Mr. Rittenhouse on that occasion, are the following extracts of a letter from the Dr. to Mr. Barton, dated July the 8th, 1769.

"Mr. Jesse Lukens left my house on Tuesday evening, at half an hour past six, where he waited till I scrawled out a pretty long letter to Mr. Rittenhouse, for whom my esteem increases the more I see him; and I shall long for an opportunity of doing him justice for his elegant preparations to observe the Transit, which left Mr. Lukens and me nothing to do, but to sit down to our telescopes. This justice I have already in part done him, in a long letter to the proprietor" (Thomas Penn, Esq.) "yesterday, and I hope Mr. Rittenhouse will not deprive us of the opportunity of doing it in a more public manner, in the account we are to draw up next week."

"I did not chuse to send Mr. Rittenhouse's original projection of the Transit, as it is a society paper, to be inserted in our minutes: but I have enclosed an exact copy. Pray desire him to take the sun's diameter again carefully, and examine the micrometer by it. The mean of our diameters come out, Hor. Diam. 31' 34", 3—Polar Diam. 31' 32", 8—Ven. Diam. 57, 98.—The Sun's is bigger than the Naut. Almanac gives: That of Venus very well. The diameters of the State-house micrometer come out less. I have compared some of *our*" (the Norriton) "micrometer-observations with those made in *town*, and do not find a difference of one second: but *all* theirs do not seem to have been taken with equal care, and differ from each other sometimes; a fault I do not find among ours. Our nearest distance of the centres comes out, I think, 10' 3", in which we agree within about one second with their nearest distance: and our time of the nearest approach of the centres, viz. 5^h 20' 32", re-

Norriton, July 18th 1769.

“Dear Sir,

“The enclosed is the best account I can give of *the Contacts*, as I observed them; and of what I saw during the interval between them. I should be glad you would contract them, and also the other papers, into a smaller compass,—as I would have done myself, if I had known how. I beg you would not copy any thing merely because I have written it, but leave out what you think superfluous.—I am, with great esteem and affection, yours, &c.

DAVID RITTENHOUSE.⁽⁶⁵⁾

To Rev. Dr. Smith.”

duced to mean time, is within one minute of the time marked for their nearest approach.”

“With my compliments to Mr. Rittenhouse and family, I am, in great haste,” &c.

Mr. Barton was then at Norriton, and Dr. Smith wrote from Philadelphia.

(65) On the 26th of the same month he thus addressed Mr. Barton on the subject:—

“I have at last done with astronomical observations and calculations for the present, and sent copies of all my papers to Dr. Smith, who, I presume, has drawn up a complete account of our Observations on the Transit of Venus: this I hope you will see, when you come to Philadelphia. I have delineated the Transit, according to our observations, on a very large scale, made many calculations, and drawn all the conclusions I thought proper to attempt, until some foreign observations come to hand, to compare with ours; all of which have been, or will be laid before the Philosophical Society. The Doctor has constantly seemed so desirous of doing me justice, in the whole affair, that I suppose I must not think of transmitting any separate account to England.”

The result of the Norriton Observations of the Transit of Venus—as well as those also made under the auspices of the American Philosophical Society, at Philadelphia and Cape Henlopen—will be found, in detail, in the first volume of the Transactions of that Society.⁽⁶⁶⁾ And “the Work itself,” to which

(66) The first volume of the Society's Transactions contains (p. 125,) among other observations of the transit of Venus in 1769, those made at Baskenridge in New-Jersey, by the late Earl of Sterling. William Alexander, the gentleman referred to, and who held this title, was (it is believed) a native of New-York. It is presumable that the title he bore was one to which he had an equitable right: It was recognized in America, the country of his birth, from the time of his first assumption of it until his death, although his claim to that honour was not juridically established in Great Britain, where, in official acts of that government, he was styled “William Alexander, Esq. *claiming* to be Earl of Sterling.” He was descended from Sir William Alexander, in the reign of James I, to whom that monarch made a grant of the province of Nova Scotia, on the 20th of September, 1621. On the 12th of July, 1625, Sir William obtained from King Charles I. a grant of the soil, lordship and domains, of that province, which, with the exception of “Port-Royal,” (Annapolis, on the Bay of Fundy,) formerly the capital of the province, he conveyed on the 30th of April, 1630, to Sir Claude de St. Etienne, lord of la Tour and Uarre, and to his son Sir Charles de St. Etienne, lord of St. Deniscourt, on condition that they should continue subjects to the crown of Scotland. This Sir William was appointed by Charles I. commander in chief of Nova-Scotia. Soon after the institution of the order of Baronets of Nova-Scotia, he had been advanced to that dignity by Charles I. viz. on the 21st of May, 1625; when the king conferred on him the privilege of coining copper-money. In 1626, he was created Viscount Sterling; and on the 14th of June, 1633, he was further promoted by the same king to the Earldom of Stirling.

The late Lord Stirling, who was seated at Baskenridge in New-Jersey, inherited his Baronetage and titles of Nobility, as heir-

Dr. Smith refers, in his Report of the Proceedings of the Nerriton Committee, bears ample testimony to the

male to Henry, the fourth Earl. He married Sarah, daughter of Philip Livingston, Esq. of New-York, by whom he had issue two daughters; Lady Mary, married to ——— Watts, Esq. of New-York, and Lady Catharine, first married to William Duer, Esq. of New-York, and after his decease to William Nelson, Esq. of the same city.

This nobleman appears to have been in some degree skilled in astronomy, and was reputed a good observer. In the first volume of the *Transactions of the American Philosophical Society* there is contained, besides his lordship's observations of the transit of Venus, a letter from him to Dr. Smith, communicating an account of his having discovered, on the 28th of June, 1770, a comet, which he observed astronomically on that and the three succeeding nights; being the same that Mr. Rittenhouse first saw on the 25th of that month; and respecting which, there are two letters from him to Dr. Smith, in the same volume.

Immediately before the American revolution, lord Sterling was one of the king's council in New-Jersey; and held also, under the crown, the appointment of surveyor-general for the eastern division of that province. With the talents of a philosopher, he united those of the soldier: On the 1st of March, 1776, his lordship was appointed a brigadier-general in the continental army, and was afterwards promoted to the rank of major-general. He was esteemed a brave and faithful officer, and served with reputation; but he died before the close of the war.

In the same volume of the *Transactions of the American Philosophical Society*, with lord Stirling's observations, there are, independent of those made under the direction of that society, the observations of the transit of Venus in 1769, made at Cambridge in New-England, by John Winthrop, Esq. F. R. S. and member of the American Philosophical Society, Hollisian Professor of Mathematics in Harvard-College—(see p. 124;) likewise, the result of those made by captain Holland and Mr. St. Germain, at and near Quebec; and by other skilful observers, at sundry places in Europe and the West-Indies; all reported (p. 120) by a committee of the American Philosophical Society.

transcendent Astronomical Abilities of Mr. Rittenhouse.—Four days after the Transit, Dr. Smith transmitted to the Hon. Mr. Penn, in London, a short account of the Norriton Observations, more particularly mentioning the times of the Contacts, and a few other circumstances attending them. This was speedily communicated by Mr. Penn to the Rev. Mr. Maskelyne,⁽⁶⁷⁾ the Astronomer Royal; who, acknowledging

(67) Afterwards Dr. Maskelyne.—“To the abilities and indefatigable attention of this celebrated astronomer,” says the Rev. Mr. Vince (in his great work on astronomy,) “nautical astronomy is altogether indebted for its present state of perfection. Of our (the English) *Nautical Almanac*, that great astronomer, M. de la Lande, thus writes: “On a fait à Bologne, à Vienne, à Berlin, à Milan; mais *Le Nautical Almanac de Londres*, est l’ephemeride la plus parfaite qu’il y ait jamais eu.” He has established the Newtonian doctrine of universal attraction upon the firmest foundation, by his experiments upon Schehallien.* His regular observations of the sun, moon, planets, and fixed stars, which are every year published, are allowed to possess an unrivalled degree of accuracy; and we may consider them as the basis of future improvements of the tables of the planetary motions. M. de la Lande, in his *Astronomie* (vol. ii. p. 121. last edit.) speaking of astronomical observations, says—“Le recueil le plus moderne et le plus précieux de tous est celui de M. Maskelyne, Astronome Royal d’Angleterre, qui commence à 1765, et qui forme déjà deux volumes in folio jusqu’ à 1786. La precision de ces observations est si grande, qu’on trouve souvent la même second pour l’ascension droite d’une planete dedécite de différentes étoiles, quoiqu’on y emploie la mesure du temps.” His catalogue of fundamental stars is an invaluable treasure. These, and his other various improvements in this science, entitle him

* The Schehallien is a mountain in Scotland, being one of the highest points in that range of mountains called the Grampian-Hills. The elevation of the Schehallien above the surface of the sea is about 1760 feet. w. s.

the receipt of the communication, by a note, dated at Greenwich the 2d of August, 1769, says—"I thank you for the account of the Pennsylvania Observations (of the Transit,) which seem *excellent and complete*,⁽⁶⁸⁾ and do honour to the gentlemen who *made* them⁽⁶⁹⁾, and those who promoted the undertaking;—

to the most distinguished rank amongst astronomers, and will render his name illustrious, as long as the science of astronomy shall continue to be cultivated."

Of Lalande himself, whose name often occurs in the following pages, Mr. Vince thus speaks :—"To that celebrated astronomer, M. de la Lande, the world is indebted for the most important improvements in the science of astronomy. Through so extensive a field, he has left no track unbeaten; almost every part has received improvements from him. His system of astronomy is invaluable, and has tended far more to the general promotion of that science than all other works which ever appeared upon the subject. The labours of this great astronomer will perpetuate his name." See Vince's *Complete System of Astronomy*, vol. ii. p. 288 and 289.

(68) Mr. Vince observes, in his *Complete System of Astronomy*, (vol. i. p. 419) that the Transit of Venus affords a very accurate method of finding the place of the node; and this he verifies expressly by calculations founded on the observations made by Mr. Rittenhouse at Norriton, in the year 1769.

(69) To so honourable a testimony, in favour of the merits of the Pennsylvania observers of this Transit, as that of Mr. Maskelyne, the acknowledgments of many other eminent foreign astronomers might be superadded: And the Rev. Dr. Smith, addressing himself to the American Philosophical Society, observes, "that societies of the first reputation in Europe are not ashamed to place our labours on a footing with their own; freely acknowledging, that we have been chiefly instrumental in ascertaining that great desideratum in astronomy, the sun's parallax;

among whom, I reckon yourself⁽⁷⁰⁾ in the first place.²²⁽⁷¹⁾

and, consequently, the dimensions of the solar system." See his Oration, delivered before the society, Jan. 22, 1773.

(70) The compliment here paid by the Astronomer-Royal to the Hon. T. Penn, proprietary of the late province of Pennsylvania, for the zeal he manifested in *promoting* the Pennsylvania Observations of the Transit of Venus, was well merited,—as the detailed accounts of that highly interesting phænomenon abundantly shew.

Nor was that the only instance in which Mr. Penn discovered his attachment to the reputation and prosperity of that extensive American territory, which continues to bear the name of his family. He was, on various occasions, a liberal and disinterested benefactor to public institutions in Pennsylvania; as a proof of which, his aggregated donations to the College of Philadelphia, prior to the American war, amounting to about twelve thousand dollars—besides a grant of the manor of Perkessie in Bucks county, containing upwards of 3000 acres,—need alone be mentioned.

But it is within the knowledge of many persons in the midst of whom these memoirs are penned, that even the Juliana Library Company, in Lancaster (an inland and secondary town of Pennsylvania,) experienced repeated proofs of the munificence of Mr. Penn, and also of his late truly noble and excellent consort, after whom that institution was named. The writer himself, well knows, from the tenor of numerous letters, not only from Mr. but Lady Juliana Penn, (who honoured the Rev. Mr. Barton with their friendship and correspondence, for the space of twenty years,—a patronage which was continued to a member of his family, long after Mr. Penn's death,) the generous and unremitted attention of both, to whatever seemed likely to promote the honour or the interest of Pennsylvania.

Thomas Penn, Esq. died on the 21st of March, 1775, when he had just completed the seventy-fourth year of his age. He was the survivor of all the children of the illustrious founder of Pennsylvania; "whose virtues, as well as abilities, he inherited

Here the observation will emphatically apply ;—
Laus est, à viro laudato laudari.

in an eminent degree,"—as was justly observed in an obituary notice published soon after his decease. Lady Juliana, his widow, survived him many years.

In the *Pennsylvania Gazette* (then published by Messrs. Hall and Sellers, but originally by *Franklin* and Hall,) for May 17, 1775, appeared the following just tribute to the memory of Mr. Penn.

"He had the principal direction of the affairs of this government for half a century, and saw such an increase of population, arts, and improvements in it, as during the like period, perhaps no man, before him, ever beheld in a country of his own. He rejoiced at the sight, was a kind landlord, and gave a liberal, often a magnificent encouragement, to our various public institutions. The Hospital, the College, our different Libraries and Religious Societies, can witness the truth of this : For he did not confine himself to sect or party ; but, as became his station, and the genius of his father's benevolent policy, he professed himself a friend to universal liberty, and extended his bounty to all. In short, as the grave, which generally stops the tongue of flattery, should open the mouth of Justice, we may be permitted to conclude his character by saying,—that he was both a great and a good man."

The writer of these Memoirs hopes he will not be censured by any Pennsylvanian of generous feelings, for introducing, in the Appendix, some elegiac verses (by an unknown hand,) in commemoration of the virtues of this worthy man ; who was not only a munificent benefactor to this country, and a bountiful patron of the Memorialist himself, as well as his family ; but who, also, took a very friendly interest in the reputation and prosperity of Mr. Rittenhouse. These verses were published in *The Pennsylvania Magazine*, for Oct. 1775.

(71) In addition to the honourable testimony of the Astronomer-Royal, in favour of the Pennsylvania Observers of the Transit of Venus, is the following eulogy of another eminent English astronomer,—as communicated by Dr. Franklin to Dr.

Before this interesting occurrence in the life of Mr. Bittenhouse is finally passed over, the reader's

T. Bond, one of the Vice-Presidents of the Philosophical Society, in a letter from London dated the 5th of Feb. 1772. The Rev. Mr. Ludlam, the gentleman referred to, and whom Dr. Franklin styles "a most learned man and ingenious mechanic"—in a paper published in the Gentleman's Magazine (and a copy of which, subscribed by himself, was sent by him to the Society,) giving an account of the Society's Transactions, more especially their Observations of the Transit of Venus,—applauds both the General Assembly and the late Proprietaries of Pennsylvania, for the countenance and assistance they gave to the making those Observations.—"No astronomers," said Mr. Ludlam, "could better deserve all possible encouragement; whether we consider their care and diligence in making the Observations, their fidelity in relating what was done, or the clearness and accuracy of their reasonings on this curious and difficult subject." He then mentions, in very honourable terms, the papers of Mr. Rittenhouse, Dr. Smith, Dr. Ewing, and Mr. Biddle, who drew up the several accounts of the Observations made at Norriton, Philadelphia, and Cape-Henlopen; and adds, that "they have very honestly given not only the Result of their Observations, but the *Materials* also, that others may examine and judge for themselves; an example worthy of imitation by those European astronomers, who are so very shy of giving particulars, and vouch for their *Instruments* and Observations in general terms."

The same gentleman, in a letter dated at Leicester (in England,) January the 25th, 1772, and transmitted to the Philosophical Society by Dr. Franklin, wrote thus:—"The more I read the Transactions of your Society, the more I honour and esteem the members of it. *There is not another Society in the world, that can boast of a member such as Mr. RITTENHOUSE*: theorist enough to encounter the problems of determining (from a few Observations) the Orbit of a Comet; and also mechanic enough to make, with his own hands, an Equal-Altitude Instrument, a Transit-Telescope, and a Time-piece. I wish I was near enough to see his mechanical apparatus. I find he is engaged in making a curious Orrery. May I ask," &c,

attention is solicited to the beautiful and animated description given by Dr. Rush, in his Eulogium, of the sensations which must have been more particularly experienced by that extraordinary man, on the near approach of the long-expected Phænomenon.—“We are naturally led here,” says the learned Professor, “to take a view of our Philosopher, with his associates, in their preparations to observe a phænomenon which had never been seen but twice⁽⁷²⁾ before,

As further evidence of the high estimation in which the Transactions of the American Philosophical Society, and particularly of the Observers of the Transit, were held abroad, Dr. Wrangel, an eminent and learned Swedish clergyman, wrote thus to Dr. Smith from Stockholm, under the date of Oct. 18, 1771 :—“I have been agreeably surprised to observe the rapid progress of your American Society, of which I esteem it a great honour to be counted a member,” &c.—“Your accurate Observations of the Transit of Venus have given infinite satisfaction to our (Swedish) astronomers ; as will the rest of your Transactions, to the literary world, when they come to be further known.”

(72) According to Mr. Lalande, (in his *Astronomie*, vol. ii.) the transit of Venus over the Sun, in 1639, observed by only Messrs. Horrox and Crabtree, two Englishmen, and which was the first ever observed, was seen in consequence of a fortunate accidental circumstance. He says, that Horrox had been occupied in making calculations for an almanack, from the Tables of Lansbergius, which are much less perfect than the Rhodolphine Tables: that these Tables of Lansbergius were in an error of 16' for the latitude of Venus, while the Rodolphine Tables had an error of only 8' ; but the one of Lansbergius made Venus pass on the sun in such a way, as that the transit ought to be visible ; whereas the tables of Kepler represented the planet as passing below him ; and thus it was, remarks Lalande, that bad tables occasioned a good observation. Relying on these tables, which Lansbergius had extolled with a confidence likely to produce

by any inhabitant of our earth, which would never be seen again by any person then living, and on which depended very important astronomical consequences. The night before the long-expected day, was probably passed in a degree of solicitude which precluded sleep. How great must have been their joy, when they beheld the morning sun!—‘and the whole horizon without a cloud;’ for such is the description of the day, given by Mr. Rittenhouse, in the report referred to by Dr. Smith. In pensive silence and trembling anxiety, they waited for the predicted moment of observation : it came,—and brought with it all that had been wished for, and expected, by those who saw it.—In our Philosopher, it excited—in the instant of one of the contacts of the planet with the sun, an emotion of delight so exquisite and powerful, as to induce fainting. This,” then remarks Dr. Rush, “will readily be believed by those who have known the extent of that pleasure which attends the discovery, or first perception of Truth.”

On the 9th of November, following, there was a Transit of Mercury over the Sun. An account of this phænomenon,—as observed at Norriton by Wil-

imposition, Horrox prepared himself to observe that transit ; and on the 24th of November, it took place at the time he expected, Venus being about half an hour on the sun when he set. He had sent on the occasion to his friend Crabtree, who was at Manchester, some miles from Hoole : and he observed the transit, likewise ; though very imperfectly, by reason of intervening clouds. W. B.

liam Smith, D. D. John Lukens, Esq. and Messrs. David Rittenhouse and Owen Biddle, the Committee appointed for that Observation by the American Philosophical Society,—was drawn up and communicated to the Society, by direction and in behalf of the Committee, by Dr. Smith: this will be found in the first volume of the Society's Transactions. In this report it is remarked, that—"the first time that ever Mercury was observed on the Sun's disk, was by Gassendus at Paris, October 28th 1631, O. S. and that the Transit of Nov. 9th was the fourth in that class; the two intermediate ones, each at forty-six years distance, having been observed by Dr. Halley, in 1677 and 1723."

Mr. Maskelyne, the celebrated English Astronomer before mentioned,⁽⁷³⁾—in a letter to Dr. Smith, of the 26th of December, 1769—expressed a wish "that the

(73) Flamsted, Halley, Bradley and Bliss, successively occupied the royal observatory at Greenwich, from the time of its institution by Charles II.; and, in the year 1765, the last of these eminent men was succeeded in the place of Astronomer-Royal, by Nevil Maskelyne, B. D. a man who, in the words of the profound French astronomer, Lalande, "has sustained perfectly the reputation of that famous observatory."

The scientific world are indebted to this excellent practical astronomer for the publication of the Nautical Almanack; and, in a great measure, for the perfection of the lunar method of ascertaining the longitude at sea. "His unwearied exertions in this great cause of humanity and science," as the compilers of the *New Edinburgh Encyclopedia* (in the article *Astronomy*) observe, "entitle him to the gratitude of the remotest posterity."

difference of Meridians of Norriton and Philadelphia, could be determined by some measures and bearings, within one-fiftieth or one-hundredth part of of the whole; in order to connect," continues Mr. Maskelyne, "your observations of the Longitude of *Norriton* with those made by Messrs. Mason and Dixon, in the course of measuring the degree of Latitude."—This request of the Astronomer Royal was communicated to the Philosophical Society of Philadelphia; in consequence of which, Dr. Smith, Mr. Lukens and Mr. Rittenhouse, were appointed to make the terrestrial measurement required. These gentlemen, having taken to their assistance Mr. Archibald M'Clean and Mr. Jesse Lukens, two able and experienced Surveyors, commenced their operations at Norriton, early on the 2d day of July following, and completed their survey on the 4th day of that month. The Report of the able Committee, to which this business was assigned by the American Philosophical Society, is also contained in the first volume of the Transactions of that learned Body. After giving various calculations, resulting from the operations of that committee, the Reporter says—"Hence, by the above measurement and work, we get Norriton Observatory 52" of time West of the Observatory in the State-house Square; which is exactly what we got by that excellent element, the external contact of Mercury with the Sun, Nov. 9th 1769."—"The external contact," continues the Reporter, "gave it something more; owing, no doubt, to the difference that will

arise among Observers, in determining the exact moment when the thread of light is compleated : and the mean of all our Observations gives the difference of Meridians, between Norriton and Philadelphia, only 4" of time more than the terrestrial measurement, and the external contact of Mercury, gave it,—which may be taken as a very great degree of exactness; if we consider that the difference of Meridians, between the long-established Observatories of Greenwich and Paris, (as Mr. De la Lande writes, Nov. 18th 1763,) was not then determined within 20' of time—For, he says, 'some called it 9' 15"; others, 9' 40";' but that he himself commonly used 9' 20", though he could not tell from what Observations it was deduced.⁽⁷⁴⁾—Finally, the Report fixes Philadelphia to be 5^h 0' 37", and Norriton, 5^h 1' 29" West from Greenwich.⁽⁷⁵⁾ The Latitude of Norriton, as deduced from the actual mensuration just mentioned, connected with Observations previously made by Mr. Rittenhouse—predicated also,

(74) It appears that the difference of the meridians of the Greenwich and Paris Observatories, is 9' 20" as assumed by Lalande. This was ascertained by the result of the measurement of the distance between those Observatories, made sometime about the year 1786 or 1787, under the sanction of the British and French governments, respectively; and this difference of meridians corresponds with what Dr. Maskelyne had before stated it to be. The last mentioned astronomer shewed, in 1787, that the latitude of Greenwich is 51° 28' 40".

(75) In relation to Paris, Mr. Lalande calculates the longitude of Philadelphia at 5^h 9' 56", according to Mr. Rittenhouse; and its latitude, as being 39° 57' 10".

in part, on antecedent Calculations of Messrs. Mason and Dixon, who, (having been furnished with a complete Astronomical Sector,) had ascertained the southernmost point of the City of Philadelphia to be in Latitude $39^{\circ} 56' 29''$, 4. N.—is stated, in the same Report, as being $40^{\circ} 9' 31''$. It came out, by the measurement, $25''.09$ less North, with respect to the southernmost point of Philadelphia, than Mr. Rittenhouse's Observations had given it; and, in making these, he had no better Instrument than Sisson's two-and-an half feet Quadrant. Nevertheless, the framer of the Report remarks, "as both were fixed by celestial observations and experienced Men, the small difference ought perhaps to be divided; and if a mean be taken, to reconcile it with the terrestrial measure, the Lat. of the south point of Philadelphia would be $39^{\circ} 56' 42''$; and that of Norriton, $40^{\circ} 9' 43''$."⁽⁷⁶⁾

The same Volume of the American Philosophical Transactions that comprehends the communications of these Proceedings—as well as various Observations, made at different places, on the then recent Transit of Venus—contains also a Memoir, by Dr. Smith, deducing the Sun's Parallax from a comparison of the Norriton and some other American Observations of the Transit of Venus, in 1769, with the Green-

(76) In Mr. Rittenhouse's "Delineation of the Transit," &c. published in the first volume of the Philosophical Society's Transactions, it appears that he assumed the latitude of the Norriton Observatory to be $40^{\circ} 9' 56''$.

wich and some other European Observations of the same : And with this paper, its learned writer has incorporated a communication, on the same subject, made to him by Mr. Rittenhouse.

Until about the period at which the latest of these favourite transactions of Mr. Rittenhouse took place—namely, his geometrical employment in ascertaining the Latitude and Longitude of Norriton and Philadelphia, respectively,—he continued to reside on his farm at Norriton. And here he still carried on, with the aid of some apprentices and journey-men, his self-acquired occupation of a Clock and Mathematical Instrument-maker : combining, at intervals, with these mechanical pursuits, an unceasing attention to his philosophical studies and researches ; and occasionally employing himself, principally with a view to his health, in some of the occupations of Husbandry. Ever an economist of Time, of which he well knew the inestimable value, none of his hours which could be spared from necessary sleep were suffered to be unemployed. In this rural abode, he enjoyed the comforts of domestic life amidst his little family, consisting only of an amiable wife and two young children. In short, no part of his time was unengaged, or uselessly passed ; although he, not unfrequently, felt the solace of friendly calls, and was gratified by visits from persons of science, worth, and distinction.

The writer of these memoirs designed to narrate those circumstances most worthy of notice, in the Life and character of Mr. Rittenhouse, in their chronological order; and this plan will be generally adhered to. Having followed our philosopher in his astronomical and mechanical pursuits, up to the year 1770, it therefore becomes proper to recur to a period of his life some few years earlier, in order to introduce the history of his Orrery,⁽⁷⁷⁾ before mentioned; a piece of

(77) See Martin's *Philosophia Britannica*, lect. xi. note 141. Though "Orrery" be a modern name, the invention of such machines as it is now applied to, is of a very early date. The first *planetarium* or *orrery*, of which we have any account, was the famous machine of Archimedes. This consisted, as Cicero (in his *Tusculan Questions*) asserts, of a sphere, of an hollow globular surface, of glass, within which was some ingenious mechanism, to exhibit the motions of the moon, the sun, and all the planets then known. Very imperfect as it must necessarily have been in other respects, it was radically erroneous, in being adapted to the *Ptolomaic* system. This is described in Latin verse, by the poet Claudius Claudianus, of Alexandria, who flourished about four centuries after the Christian era, and more than six centuries after the Syracusean philosopher.

Cicero, in his book *De Naturâ Deorum*, mentions one invented by Posidonius the Stoic, in his time, and about eighty years before the birth of Christ. He describes it as a "sphere,"—"in every revolution of which, the motions of the sun, moon, and five planets were the same as in the heavens, each day and night"

Nothing further is heard of orreries or spheres, until about five hundred and ten years after Christ, when Anicius Manlius Torquatus Severinus Bœthius, the Roman Consul, (who was also a Christian, and a Peripatetic Philosopher,) is said to have contrived one. Theodoric, king of the Goths, calls it "*Machinam Mundo gravidam, Cælum gestabile, Rerum Compendium* : But Bœthius was, nevertheless, put to death by this Gothic king, A. D. 524. A long and dismal reign of barbarism and ignorance

mechanism which is admitted, by all competent judges of its merit, to be one of the greatest of his works.

The Planetarium invented by Mr. George Graham,⁽⁷⁸⁾—and a model of which was improperly retained by Mr. Rowley, its constructor,—had, long before the appearance of Mr. Rittenhouse's machine, acquired the name of an Orrery; in compliment to Richard Boyle, Earl of Orrery,⁽⁷⁹⁾ who merely patronized the construction of one, from the artist Rowley's pirated model. This complimentary appellation of • Mr. Graham's then newly invented Planetarium is

having succeeded this period, no further mention is made of any thing in the nature of a planetarium, for about one thousand years. See Note 41.

(78) In the work, entitled, "A new and general Biographical Dictionary," &c. published in 1761, the *Invention of Graham's Planetarium* is attributed to the celebrated Charles Boyle, Earl of Orrery; and the compilers of that work cite this *supposed* Invention of Lord *Orrery*, "as an indubitable proof of his mechanical genius." On this authority, the compilers of the British Encyclopædia (reprinted in Philadelphia by Mr. Dobson,) in the very words of the Biographical Dictionary, make the nobleman from whom the first English Orrery derives its name, the Inventor. But it seems to be now pretty generally admitted, that his lordship was only the Patron of the machine, made for George I. by Mr. Rowley.

(79) This accomplished nobleman, who was also the fourth Earl of Cork, in Ireland, and the third Earl of Burlington, in England, was born in the year 1695, and died in 1753. He was a great encourager of the liberal arts, possessed an extraordinary taste and skill in architecture, and was animated by a most exalted public spirit.

said to have been bestowed upon it by Lord Orrery's friend, Sir Richard Steele;⁽⁸⁰⁾ and, the name being thus applied to *that* machine, all those of the nature of *Planetaria*, subsequently constructed,—however variant in usefulness or design, from the original one bearing the name of an "Orrery,"—were denominated *Orreriss*.⁽⁸¹⁾ In compliance, then, with long established

(80) Mr. Martin (in his *Philosophia Britannica*) says: "The Orrery, though a modern name, has somewhat of obscurity in respect to its origin; some persons deriving it from a Greek word, which imports to *see* or *view*:" "But others say, that Sir Richard Steele first gave this name to an instrument of this sort, which was made by Mr. Rowley for the late Earl of Orrery, and shewed only the movement of one or two of the heavenly bodies. From hence many people have imagined, that this machine owed its invention to that noble lord." This Orrery was a large one; and, although it is represented by Mr. Martin as a very defective machine, it was purchased by King George I. at the price of one thousand guineas.

(81) Besides the Orrery here referred to, as the invention of the celebrated mechanic and watchmaker, Mr. George Graham, a like machine was afterwards contrived by Mr. James Ferguson, an eminent Scotch mechanic and astronomer, and another planetarium of the same kind, by Mr. William Jones, an ingenious mathematical instrument maker, of London. From the planetarium or orrery of Graham, however, as a model, all the modern orreries, prior to Mr. Rittenhouse's, appear to have been taken. The one constructed by Mr. Rowley is said to be very similar to that invented by Dr. Stephen Hales.

But the idea of a planetarium, somewhat similar to the Rittenhouse-orrery, seems to have been conceived by Huygens, who died in 1695. A collection of this celebrated philosopher's works was printed at Leyden in the year 1724 and 1728: and in these will be found the description of a planetarium; "a machine" (says Lalande, in speaking of the one contemplated by Huygens,)

usage, Mr. Rittenhouse modestly called his Planetary-machine, from the first projection of it, an Orrery; although the entire merit, both of the invention and construction, belonged to himself.⁽⁸²⁾

It is not ascertained, at what time Mr. Rittenhouse first conceived the plan of that extensive, complicated and inestimable Orrery, which he afterwards executed. Probably, he had long thought on the subject, before he publicly announced his design. It is certain, however, that before the beginning of the year

“which represents, by wheel-work, the revolutions of the planets around the sun and of the moon around the earth, in their durations and natural dimensions; with their excentricities, their inequalities, and their inclinations towards the ecliptic.” See Laland’s *Astron.*

(82) Mr. Jefferson remarks, in his *Notes on Virginia*, that “Mr. Rittenhouse’s model of the planetary system has the plagiarist appellation of an Orrery.” This was, undoubtedly, a plagiarist name, in its relation to Graham’s Planetarium, of which Lord Orrery was the supposed inventor: but the charge of plagiarism does not properly apply to the same name, when bestowed by Mr. Rittenhouse himself, on the grand machine of his own invention and construction. How improper soever this name may have been in its first application to a planetarium, it has since been generally applied to similar machines; and it has thus acquired an appropriate signification in relation to them. Mr. Rittenhouse did not choose to depart from the appellation in common use, in naming a machine for surpassing, in ingenuity of contrivance, accuracy and utility, any thing of the kind ever before constructed; yet, in all those points of excellence, he was the inventor of that admirable machine, which has been generally denominated, by others, “the Rittenhouse Orrery.”

1767, there was some correspondence and some understanding, respecting it, between himself and the Rev. Mr. Barton. It appears in fact, that, prior to that period, Mr. Barton had been fully apprized of his brother-in-law's desire to carry into effect his meditated design of constructing a complete Orrery, on a plan entirely new ; and that some arrangement was previously made, between these gentlemen ; by which Mr. Barton undertook to indemnify Mr. Rittenhouse, for such actual expenditures as he should incur in making the machine and his loss of time while employed in the work, not exceeding a stipulated sum ; provided he should not be able to dispose of it, when finished, at a price then fixed on. The prudential caution of our young Philosopher (then about thirty-four years of age,) and the public spirit of his friend, grounded on the confidence he had in the artist's talents and abilities, were alike evinced on this occasion.

The first written communication made by Mr. Rittenhouse to Mr. Barton, on the subject of the Orrery, is contained in a letter under the date of Jan. 28th, 1767 : it is in these words :—" I am glad you took the pains to transcribe, and send me, Martin's *Account of Orreries*.⁽⁸³⁾ "Two forms (he says) have principally obtained, the Hemispherical Orrery and the Whole Sphere. But the idea given us by the former,

(83) See Note 77.

is very unnatural and imperfect. An Orrery, then, adapted to an Armillary Sphere is the only machine that can exhibit a just idea of the true System of the World.”—“But in my opinion,” says Mr. Rittenhouse, “the latter is likewise very unnatural: for, what has a Sphere, consisting of a great number of metaline Circles, to do with the true System of the World? Is there one real, or so much as apparent Circle, in it? (the bodies of the Sun and Planets excepted.) Are they not all merely imaginary lines, contrived for the purpose of calculation? I did not intend to let one of them have a place in my Orrery, except the Zodiac, on which I would have the true latitude and longitude of each planet pointed out by its proper Index.”

“I did not design a Machine, which should give the ignorant in astronomy a just view of the Solar System: but would rather astonish the skilful and curious examiner, by a most accurate correspondence between the situations and motions of our little representatives of the heavenly bodies, and the situations and motions of those bodies, themselves. I would have my Orrery really useful, by making it capable of informing us, truly, of the astronomical phænomena for any particular point of time; which, I do not find that any Orrery yet made, can do.”

“But,” continues Mr. Rittenhouse, “perhaps it may be necessary to comply with the prevailing taste: If

so, my plan must be entirely altered ;—and this is a matter that must be settled between you and me, before I can proceed. However, I shall send you, in my next, a particular account of my design ; such as I would have it, if not limited by the fear of making it too expensive.—A specimen (if I may so call it) of the most curious part of it, though much smaller than that intended for the Orrery, is now in hand, and I hope will soon be finished.”

To this letter Mr. Barton returned the following answer.

“ Lancaster, February 21st, 1767.

“ Dear Brother,

“ I received, a few days ago, yours of the 28th ult.—after it had undergone the torture of some Dutchman’s pocket, which compelled it to force its way through the cover : However, the inside did escape without many fractures ; so that I had the pleasure of getting it into my hands in such a condition that I could read it.

“ Had I known your distress, at the time you received my letter, I should have sincerely felt for you. I well know the anxiety of an husband, on such occasions, and my heart will ever join in sympathy with him : For you, my feelings would have been doubled, as a husband, as my friend and brother. Glad I am, therefore, that I have no occasion to condole with you, but rather to rejoice ; and I most sincerely and affectionately congratulate you, on the escape and recovery

of your good girl, and wish you joy of your daughter. I desire to offer my best regards to sister Nelly, for the compliment she intended me, had her child been a boy. Her intention was kind, and I hope to have the continuance of her favourable opinion of me.

“I am much pleased with your remarks on Spherical Orreries, or rather on the circles generally adapted to such Orreries. Mr. Rowning seems to be so much of the same opinion, that I could not deny myself the pleasure of transcribing some part of his account of Orreries, and of an imaginary machine, which he thinks might be made very useful.⁽⁸⁴⁾ Several of his hints appear to me ingenious, and I hope they will not be unacceptable to you.

“I would have you pursue your Orrery in your own way, without any regard to an ignorant or prevailing taste. All you have to study is truth, and to display the glorious system of Copernicus in a proper manner;—and to make your machine as much an original, as possible. I beg you will not limit yourself in the price. I am now perfectly convinced, that you can dispose of it to advantage; and should be sorry you would lose one hour more in fears or doubts about it. In fact, I have laid such plans for the disposal of it, that I have almost a moral certainty of having a demand for more than one of the kind. I have not time to write you as fully as I could wish, as the tran-

(84) See *A Compendious System of Natural Philosophy*, &c. by J. Rowning, M. A. part iv. chap. 15.

scribing from Rowning has detained me so long, and I am this moment setting out for Caernarvon.

“ My letter to the Propretor⁽⁸⁵⁾ is delayed, till I can send him the account of your design, which you are pleased to promise me. You say you have “ a specimen” in hand : I should be glad to know what it is.

“ I shall not neglect the things you mentioned to me, as I shall always receive a pleasure in serving you. * * * * *

* * * * *

* * * * *

* * * * * She joins me in love to father, mother and all friends.—I am, in haste, dear Davy, your very affectionate friend and brother,

“ THOMAS BARTON.

“ P. S. Forgive this wretched scrawl—I have not time to examine whether I have committed any errors in copying Mr. Rowning.

“ I beg leave to recommend Huygens', Cotes', Helsham's, and Power's Philosophy to you. You will be much pleased with them.

(85) The Hon. Thomas Penn, of Stoke-Poges, in Buckinghamshire, heretofore one of the Proprietaries of the former province of Pennsylvania. This gentleman was then usually styled, in Pennsylvania, “ The Proprietor.”

"I wish you would purchase Bion's Description of Philosophical and Mathematical Instruments, &c."

"MR. DAVID RITTENHOUSE."

His next letter to Mr. Barton, covering the promised Account of his Orrery, is dated the 27th of March, 1767: and this, it will be perceived, is very nearly a year before a description of it was communicated to the American Philosophical Society in Philadelphia. In this letter, he says—"Rowning's opinion of Orreries pleases me more than any thing I had met with before. The idea of his *imaginary* machine naturally presents itself to persons conversant in Astronomy; but, if actually made, it could not answer the purpose, unless prodigiously large,—which I presume is the reason it has never been done."

I send you a description of *my* imaginary machine: the foundation of it is now laid; and I hope that part of it, containing the mechanical Astronomy of the Moon, will be finished some time this spring: *then* we shall be able to judge, whether my abilities are equal to the undertaking."

The "Description" here referred to, in Mr. Rittenhouse's own hand-writing, is now before the writer of these Memoirs; and is thus endorsed by the Rev. Mr. Barton—"Original Description of Mr.

Rittenhouse's Orrery, first communicated to Thomas Barton."—For the satisfaction of those, who may not have an opportunity of seeing the American Philosophical Society's Transactions, in which this short account of the Orrery was afterwards published; and, as this *original* description of it differs somewhat from the *printed* one, it is presumed that the introduction of the former into this work, will not be unacceptable to the reader.

The impossibility of conveying to the mind of any one, even the most intelligent and skilful, by means of either any delineation upon paper in the nature of a diagram, or by words, an adequate idea of so complex and multiform a machine as the one now about to be described, will instantly be conceived. Indeed no description, alone, can render the nature of its construction, and the many curious and useful purposes it is capable of answering, perfectly intelligible to the most scientific Astronomer. Mr. Rittenhouse's very concise description of his Orrery will, therefore, necessarily be found defective: it is thus worded by himself.

“ DESCRIPTION OF A NEW ORRERY.

“ This Machine is intended to have three faces, standing perpendicular to the horizon: that in the

front to be four feet square, made of sheet-brass, curiously polished, silvered, and painted in proper places, and otherwise ornamented. From the centre arises an axis, to support a gilded brass ball, intended to represent the Sun. Round this ball move others, made of brass or ivory, to represent the Planets : They are to move in elliptical orbits, having the central ball in one focus ; and their motions to be sometimes swifter, and sometimes slower, as nearly according to the true law of an equable description of areas as is possible, without too great a complication of wheel-work. The orbit of each Planet is likewise to be properly inclined to those of the others ; and their Aphelia and Nodes justly placed ; and their velocities so accurately adjusted, as not to differ sensibly from the tables of Astronomy in some thousands of years.

“ For the greater beauty of the instrument, the balls representing the planets are to be of a considerable bigness ; but so contrived, that they may be taken off at pleasure, and others, much smaller, and fitter for some purposes, put in their places.

“ When the Machine is put in motion, by the turning of a winch, there are three indexes which point out the hour of the day, the day of the month, and the year (according to the Julian account,) answering to that situation of the heavenly bodies which is then represented ; and so continually, for a period of 5000 years, either forward or backward.

“ In order to know the true situation of a Planet at any particular time, the small set of balls are to be put each on its respective axis; then the winch to be turned round until each index points to the given time. Then a small telescope, made for the purpose, is to be applied to the central ball; and directing it to the planet, its longitude and inclination will be seen on a large brass circle, silvered, and properly graduated, representing the zodiac, and having a motion of one degree in seventy-two years, agreeable to the precession of the equinoxes. So, likewise, by applying the telescope to the ball representing the earth, and directing it to any planet,—then will both the longitude and latitude of that planet be pointed out (by an index and graduated circle,) as seen from the earth.

“ The two lesser faces are four feet in height, and two feet three inches in breadth. One of them will exhibit all the appearances of Jupiter and his Satellites—their eclipses, transits, and inclinations; likewise, all the appearances of Saturn, with his ring and satellites. And the other will represent all the phenomena of the moon, particularly, the exact time, quantity, and duration of her eclipses—and those of the sun, occasioned by her interposition; with a most curious contrivance for exhibiting the appearance of a solar eclipse, at any particular place on the earth: likewise, the true place of the moon in the signs, with her latitude, and the place of her apogee in the nodes; the sun’s declination, equation of time &c. It must

be understood, that all these motions are to correspond exactly, with the celestial motions; and not to differ several degrees from the truth, in a few revolutions, as is common in Orreries.

“If it shall be thought proper, the whole is to be adapted to, and kept in motion by, a strong pendulum-clock; nevertheless, at liberty to be turned by the winch, and adjusted to any time, past or future.”

“N. B. The diurnal motions of such planets as have been discovered to revolve on their own axes, are likewise to be properly represented; both with regard to the Times, and the situation of their Poles.”

The foregoing is a literal copy of the original manuscript; and such readers of this article as may think proper to compare it with the printed description of Mr. Rittenhouse's Orrery, communicated to the American Philosophical Society by Dr. Smith, on the 21st of March 1768, and contained in the first volume of that Society's Transactions, will find some (though, on the whole, not very essential) differences, in the two descriptions. The concluding paragraph, indeed,—designated, in each, by a N. B.—is materially variant in the two: and it appears, by its having been announced in the published (and later) account of this machine, that, “the clock part of it may

be contrived to play a great variety of Music," (a suggestion wholly omitted in Mr. Rittenhouse's original communication, made to the Rev. Mr. Barton,) that the philosophic Artist had been afterwards induced, in one particular at least, "to comply with the prevailing taste."⁽⁸⁶⁾ But this may be readily accounted for: our artist had previously made some extremely curious and beautiful Time-pieces, to each of which was attached the mechanism of a Musical Clock, in addition to a limited Planetarium, in miniature. These were in the hands of gentlemen of respectability and taste:⁽⁸⁷⁾ and they were much and generally admired,

(86) This design was, however, finally abandoned.

(87) One of these valuable clocks, which is of a large size, with an accurate little planetarium attached to its face and placed above the dial-plate,* was made for the late Mr. Joseph Potts, of Philadelphia county, who paid for it, as the writer is informed, six hundred and forty dollars. In the spring of the year 1774, it was purchased by the late Mr. Thomas Prior, of Philadelphia; to whom, it is said, general Sir William Howe made an offer of one hundred and twenty guineas for it, shortly before the evacuation of that city, in 1778. It is also said, that Don Joseph de Jaudenes, late minister of Spain to the United States, offered Mr. Prior eight hundred dollars for this clock, with a view of presenting it to his sovereign. Mr. Prior, however, retained it until his death, in the spring of the year 1801: after which, it passed through two other hands, successively, into the possession of Professor Barton, of Philadelphia, whose property it now is.

* The area of the face of the dial plate is twenty inches square, and the motions and places of the planets of our system are represented on a circular area of eight inches in diameter.

as well for the great ingenuity displayed by the constructor, in these combined and pleasing operations of his machinery, as for the superior accuracy and beauty of the workmanship; qualities eminently conspicuous in all his mechanical productions.

It appears, that when Mr. Rittenhouse sent the foregoing description of his projected Orrery to Mr. Barton—that is to say, on the 27th of March, 1767⁽⁸⁸⁾—

(88) It appears that Mr. Barton must have transmitted to the honourable Mr. T. Penn, in London, a description of the Orrery, very soon after it was publicly communicated to the Philosophical Society in Philadelphia; for, a letter from Mr. Penn to that gentleman, dated July 22, 1768, contains this remark—"The account you give me of Mr. Rittenhouse's Orrery, is what I could not have imagined could be executed in Pennsylvania; and I shall be much pleased to see a copper-plate of it, for which I would make that gentleman a present, for his encouragement; or, perhaps he may be induced to bring it hither, and exhibit it, by publicly lecturing on it."

Had Mr. Rittenhouse taken an Orrery to England, and it appears by his letters of March 15, 1771, and Feb. 3, 1772, quoted in the text, that he had seriously intended going thither, he would, very probably, have derived great emolument, as well as fame, by delivering lectures on astronomy, adapted to his orrery; and it is probable, that, in addition to the public encouragement he might reasonably have calculated upon, Mr. Penn would have patronised him, with his usual liberality. Of the disposition of that worthy gentleman to befriend him, Mr. Rittenhouse seems to have been fully sensible: for, in a letter of the 11th of December, 1768, to Mr. Barton, he said—"I am very desirous to send Mr. Penn something: as the orrery is not finished, perhaps a description of it, with draughts of the clock I have just made, may answer the purpose, together with some little instrument: I shall be glad to have your thoughts on the matter."

the "foundation" of it was "laid." But, notwithstanding his earnest wishes prompted him to the utmost diligence, in his exertions to finish it, many circumstances concurred to retard its completion. The magnitude of the undertaking—the multiplicity of the work—and, perhaps, the difficulty of sometimes readily procuring, even from Philadelphia, the necessary materials,—all conspired, to prevent as early a completion of the machinery as he had anticipated: and, added to these causes of unavoidable delay, was the yet unabandoned pursuit of his professional business.

The Orrery was, nevertheless, then his favourite object. On the 18th of June, 1767, he wrote to Mr. Barton, thus—"I hope you will persuade your Pequea friends to stay for the clocks, till harvest is over; and then, I think, I may venture to promise them, for ready money: but, at this time, one part of the Orrery is in such forwardness, that I am not willing to lay it by till it is done. I hope it will far exceed the description I gave you of it. To-morrow morning I am to set off for Reading, at the request of the Commissioners of Berks county, who wrote to me about their town-clock. They had employed a * * * * * to make it, who, it seems, is not able to go through with

It may be proper here to remark, that no engraving, or drawing, could give an adequate idea of the orrery: and that the clock, mentioned by Mr. Rittenhouse, was one of those of which a short notice is introduced, immediately after the original description of the orrery, in the text.

it: if I should undertake to finish it, this will likewise retard the great work."

Amidst the more important philosophical pursuits which engaged Mr. Rittenhouse's attention before his removal to Philadelphia, as well as after he fixed his residence in that city, he now and then relaxed the energy of his mind from its employment in laborious investigations, by bestowing a portion of his time on minor objects in physical science; and indeed, sometimes, even on little matters of ingenuity, curiosity and amusement. As instances of this, he addressed to the Rev. Mr. Barton the letter under the date of the 20th of July, 1768, which will be found in the Appendix; and also another, dated the 4th of February, 1770, to which there is the following postscript:

"I have," says he, "seen a little curiosity, with which you would be pleased; I mean the glass described by Dr. Franklin, wherein water may be kept in a boiling state, by the heat of the hand alone, and that for hours together. The first time I shall be in Lancaster, where I hope to be next June, I expect to prevail on you to accompany me to the Glass-house,⁽⁸⁹⁾ where we may have some of them made, as

(89) The glass-house mentioned in the text, was erected several years prior to the American revolutionary war, at the village of Manheim, about twelve miles from the borough of Lancaster, by Mr. Henry William Stiegel, an ingenious and enterprising German gentleman. Glass of a very good quality and

well as some other things I want.”—A description of this instrument, then usually called *Dr. Franklin’s Pulse-Glass*,⁽⁹⁰⁾ by means of which water may be made to boil, *in vacuo*, by the heat of the human hand, was communicated by Mr. Rittenhouse to Mr. Barton in a subsequent letter.

wormanship, was made at that glass-house ; as will appear by the following extracts from a letter of Mr. Rittenhouse to Mr. Barton, written in the summer of 1771, and acknowledging the receipt of a barometer-tube executed there. He says—“I am obliged to you for the glass tube ; it will make a pretty barometer, though the bore is somewhat too small. I have compared it with an English tube, and do not think the preference can, with any reason, be given to the latter.” And in the same letter, he requests Mr. Barton to procure for him, from the glass-house, “some tubes of a size fit for spirit-levels.” “The bore,” says he, “must be half an inch in diameter, and from four to eight inches in length ; as straight as possible, and open at one end only.”

While Mr. Stiegel was thus early and meritoriously carrying on the manufacture of glass, he was also engaged in manufacturing iron at Elizabeth-Furnace in the vicinity, which then belonged to him. But he proved unfortunate in his extensive undertakings, and the glass-works have not since been in operation. The foundry of Elizabeth, together with the great establishment of iron-works connected with it, and of which Robert Coleman, Esq. of Lancaster, is now the proprietor, are well known.

(90) Dr. Franklin is said to have first met with the Pulse-Glass in Germany, and to have introduced it into England with some improvement of his own.

MEMOIRS
OF THE
LIFE OF DAVID RITTENHOUSE;
CONTINUED,
FROM THE TIME OF HIS SETTLEMENT IN PHILADELPHIA.

IN the autumn of 1770, our Philosopher changed the place of his residence ; removing, with his family, into the city of Philadelphia. To this exchange of his beloved retirement, at his Norriton farm, for the scene of noise and activity presented by a great town, he must have been induced by the flattering prospects of advantage to himself and usefulness to the public, pointed out to him by his friends : and among these, Dr. Smith was one of the most urgent for the measure. The following extract of a letter, dated the 27th of January, 1770, and addressed to the Rev. Mr. Barton by that gentleman, will explain his motives, and at the same time exhibit Mr. Rittenhouse's views, on that occasion : it will also afford strong evidence of the Doctor's friendship for our philosopher.

“As my esteem for Mr. Rittenhouse increases, the more I know him,” said Dr. Smith, “I set on foot a

project, assisted by my neighbours, the Wissahickon millers, to get him recommended to the Assembly, to be put in as a trustee of the loan-office, in the bill now before the house. I first broke the matter to the speaker;⁽¹⁾ telling him, Mr. Rittenhouse ought to be encouraged to come to town, to take a lead in a manufacture, optical and mathematical, which never had been attempted in America, and drew thousands of pounds to England for instruments, often ill finished; and that it would redound to the honour of Philadelphia to take a lead in this, and of the Assembly, to encourage it. The speaker took the proposal well, and, in short, so did every person applied to; and when the vote passed, the day before yesterday, for the three trustees, the whole house rose for Rittenhouse's name; so that Mr. Allen,⁽²⁾ who was hearty among the rest for him, observed—"Our name is Legion, for this vote,"—though Dr. M**** got in only by the speaker's casting vote.

"This will give you pleasure, as it shews that a good man is capable of sometimes commanding all

(1) Joseph Galloway, Esq. a representative in assembly from the county of Bucks. He was speaker of the house, from the year 1766 to 1773, inclusively; excepting a short interval in the session of 1768-9, in which Joseph Fox, Esq. officiated as speaker.

(2) William Allen, Esq. chief-justice of the supreme court of Pennsylvania, and a member of assembly from the county of Cumberland.

parties ; and it will be creditable for Mr. Rittenhouse, even if the bill should not succeed for the present. The salary to each of the trustees is 200*l*.⁽³⁾ Both the Mr. Ross's,⁽⁴⁾ Mr. Biddle,⁽⁵⁾ and Mr. Carpenter,⁽⁶⁾ were hearty in their interest for Rittenhouse,—so was Minshull ;⁽⁷⁾ and I hope you will thank them all. The governor⁽⁸⁾ declared (and with more frank-

(3) Equal to 533 Spanish or American dollars.

(4) John and George Ross, Esqrs. lawyers of great respectability, and brothers ; the former a resident in Philadelphia ; the latter in Lancaster. Mr. George Ross was a member of the first congress ; and was appointed by the assembly on the 5th of April, 1775, judge of the admiralty-court for Pennsylvania.

(5) Edward Biddle, Esq. a lawyer of eminence, and a representative in assembly for the county of Berks, in which he resided. This gentleman was one of the delegates appointed to the congress of the 10th of May, 1775, under an unanimous resolution of the assembly, passed in December, 1774 ; but, having succeeded Mr. Galloway as speaker of that house, in the session of 1774-5, he did not take his seat in congress, with his colleagues. These were John Dickinson, Charles Humphreys, John Morton, George Ross, Thomas Mifflin, Benjamin Franklin, Thomas Willing and James Wilson, Esqrs.

(6) Emanuel Carpenter, Esq. long a respectable member of assembly from Lancaster county.

(7) Thomas Minshull, Esq. a respectable member of the house, from York county.

(8) The Hon. John Penn.—This worthy gentleman, a grandson of the celebrated William Penn, was lieutenant-governor of Pennsylvania, under the chief proprietaries of the province, from October 1763, to May 1771 ; and again, from August 1773, until the revolution.

ness than usual,) when I waited on him,—“Mr. Rittenhouse’s name shall never be an objection with me, in this or any other bill: on the contrary, I shall rejoice if the bill come to me in such a form, as that I can shew my regard for him.”

“Yet, my dear friend,” adds Dr. Smith, “I fear this bill will not pass; and the Governor may be reduced to the hard dilemma, of even *striking out* the name he would wish *in*, if he had the nomination himself. The house insist on putting the names in the bill, before it goes up: the Governor contends, that he ought to have at least a share in the nomination. This matter has been long litigated. The governor, to maintain his right, always strikes out *some* names—even though he approves of them, and puts in others. This he did last year, and put in the name of Dr. M* * * *, and the other trustee now in the bill. The house would not admit his amendment, then; but now, this year, they take two of the very men the governor had appointed last year, vote them in themselves, and join Mr. Rittenhouse with them. The governor cannot well *negative* any of those approved by him, before; yet he must *negative some one*, to assert his right;—and I believe it would really give him pain, if *that* one should be *David*.”

“I am thus particular,” continues the Doctor, “that you may understand the whole, and not think our friend slighted by the government, even if this thing

should not succeed. All the council⁽⁹⁾ are hearty for Mr. Rittenhouse; and if he does not get this matter, he will not be long without something else. But I hope some expedient may be hit upon, to compromise the matter, should the bill not have faults in itself, that may set it aside."

The warm and sincere interest which Mr. Barton took in every thing that seemed likely to promote the welfare of his brother-in-law, was manifested on this occasion. In his answer to Dr. Smith's letter, written a week after, he says: "Your letter by Mr. Slough was so truly obliging and friendly, that I cannot think of words strong enough to express my gratitude. Rittenhouse, I trust, will always be sensible of the favours you have shewn him, and of the uncommon pains you have taken to serve him on this occasion, which have been represented to me, fully, by Mr. Slough.⁽¹⁰⁾ Accept then, dear sir, my most hearty thanks for your kind offices in behalf of Mr. Rit-

(9) The proprietary's and governor's council, consisting of James Hamilton, William Allen, Joseph Turner, William Logan, Richard Peters (D. D.), Lynford Lardner, Benjamin Chew, Thomas Cadwallader, Richard Penn, James Tilghman, Andrew Allen, and Edward Shippen, jun. Esquires. Joseph Shippen, jun. Esquire, officiated many years as provincial secretary and clerk of the council.

(10) Matthias Slough, Esq. who served several years with reputation as a representative in the assembly, from the county of Lancaster.

tenhouse.* Accept of my wife's best thanks, also — — She shed tears of gratitude, when she read your letter, (for her attachment to her brother David is very great,) and declared, in a high strain of enthusiasm, that Dr. Smith was the most steady friend and obliging man that ever lived; that she should honour and respect him, while living, and, should she survive him, would always revere his memory. Thus it was, that the sister of your 'optical and mathematical' friend expressed herself on the occasion."

Notwithstanding the fair prospects which Mr. Rittenhouse thus had, in the beginning of the year 1770, of being enabled to establish himself in Philadelphia, with a handsome salary of 200*l. per annum* from the government, in addition to such funds as he might reasonably calculate on acquiring, in that capital, by his professional occupation, both he and his friends were disappointed, in regard to the contemplated official station: The assembly rose, as Dr. Smith seemed to have anticipated a very short time before, without passing the loan-office bill.

Mr. Rittenhouse's actual removal into the city, in the succeeding autumn, appears to have been made in pursuance of a previous determination more recently formed;⁽¹¹⁾ one founded on some plan, not liable to be

(11) On the 4th of Feb. 1770, he mentioned to Mr. Barton his then contemplated removal into that city, in these terms—"Dr. Smith, to whom I am indebted for many kindnesses, is very

affected by such contingencies as have been just noticed. Prior to that period, his Orrery was nearly if not quite completed: for it appears by a letter which he wrote to Mr. Barton from Norriton, on the 12th of May preceding his removal to the city, that the trustees of Nassau-Hall, in New-Jersey, had then agreed on some terms with him, as the inventor, maker, and proprietor, for the purchase of it.⁽¹²⁾ The trustees of the College of Philadelphia had likewise been in treaty with him, for the same purpose: but the Princeton College succeeded in their negociation, and thus acquired the property of the Orrery first constructed.

This circumstance gave, at the time, some dissatisfaction to the more immediate friends of the Philadelphia institution; though it is confidently believed that no degree of censure, whatever, could be justly imputed to Mr. Rittenhouse, on the occasion; perhaps, none was fairly chargeable on any of the parties. Mr. Rittenhouse, however, experienced some unpleasant sensations; although, in order to avoid any suspicion of

urgent to have me come to Philadelphia to reside, which it is probable I may do shortly: but I am not yet determined. If I live to write again, you shall know more of my mind; in the mean time, I shall be glad to have your opinion of the matter."

(12) Since writing the above the author has ascertained, that towards the close of April, 1770, the orrery was purchased for the college of New-Jersey. On the 23d of that month, Dr. Witherspoon, then the president of that college, accompanied by some gentlemen, went to Norriton for that purpose, and it appears that the orrery was then nearly finished.

his having been actuated by an undue partiality towards the College of Princeton, he had made such a stipulation in favour of its sister-institution, as could not fail, when made known, to remove any imputation of impropriety of conduct on his part, in the transaction. This is explained by the following passage in the letter to his brother-in-law, last referred to,—evidently penned without any reserve. After noticing the dissatisfaction just mentioned, he says—"I would not, on any account, incur the imputation of cunning; nor are there, probably, many persons living who deserve it less: yet I am greatly mistaken if this matter" (his transfer of the Orrery to Princeton College) "does not, in the end, turn out to my advantage, and consequently, to your satisfaction. At present, the point is settled as follows: I am to begin another" (Orrery) "immediately, and finish it expeditiously, for the College of Philadelphia. This I am not sorry for; since the making of a second will be but an amusement, compared with the first: And who knows, but that the rest of the colonies may catch the contagion."⁽¹³⁾

(13) The following extract of a letter from Dr. Smith to Mr. Barton, written the day after Mr. Rittenhouse's on the same subject, will further explain the embarrassing circumstances that attended this transaction, and the delicate situation in which Mr. Rittenhouse, particularly, was placed.

"I never," said the Doctor, "met with greater mortification, than to find Mr. Rittenhouse had, in my absence, made a sort of agreement to let his Orrery go to the Jersey College. I had constantly told him, that if the Assembly did not take it, I would

The second Orrery was soon completed : for, on the 15th of March, 1771, only ten months after the

take it for our College, and would have paid the full sum, should I have begged the money. I thought I could depend, as much as on any thing under the sun, that after Mr. Rittenhouse knew my intentions about it, he would not have listened to any proposal for disposing of it, without advising me, and giving our College the first opportunity to purchase. I think Mr. Rittenhouse was never so little *himself*, as to suffer himself to be taken off his guard on this occasion. This province is willing to honour him, as her *own* : and believe me, many of his friends wondered at the newspaper article ; and regretted that he should think so little of his *noble* invention, as to consent to let it go to a village ; unless he had first found, on trial, that his friends in this city had not spirit to take it : For if he would wish to be known by *this work*—and introduced to the best business and commissions for instruments, from all parts of the continent,—his *Orrery* being placed in our College, where so many strangers would have an opportunity of seeing it, was the sure way to be serviceable to Himself.

“ You will think, by all this, that I am offended with him, and that our friendship may hereby be interrupted : Far from it—I went to see him, the day the newspaper announced the affair. I soon found that I had little occasion to say any thing : he was convinced, before I saw him, that he had gone too far. But still, as no time was fixed for delivering the Orrery, I was glad to find he had concluded that it should not be delivered till next winter ; against which time, he said, he could have a *second* one made, if this one staid with him for his hands to work by. As I love Mr. Rittenhouse, and would not give a man of such delicate feelings a moment’s uneasiness, I agreed to wave the *honour* of having the first Orrery, and to take the second.”

In fact, the Orrery was not at that time finished ; for Mr. Rittenhouse then informed Dr. Smith, that he was under the necessity of waiting for brass from England, to enable him to complete it. “ The result (continued the Doctor) will be, I think, that he will keep his Orrery till towards winter ; and

date of his last quoted letter to the Rev. Mr. Barton, he wrote to that gentleman, on the subject, in these words. "Dr. Smith bids me to tell you he will write by your son William. He is fully employed, at present, with his Lectures, and has great success, having raised upwards of two hundred pounds.⁽¹⁴⁾ I am sure you would afford me *some additional compassion*, if you knew the drudgery of explaining the Orrery to two

should they not *then* receive it, in the Jersies, they will take it at New-York."

On the 7th of the following month, Dr. Smith wrote thus finally, to Mr. Barton, on this subject—"Your and my friend, Mr. Rittenhouse, will be with you on Saturday. The Governor says, the Orrery shall not go: he would rather pay for it, himself. He has ordered a meeting of the Trustees on Tuesday next; and declares it as his opinion, that we ought to have the *first* Orrery, and not the second,—even if the second should be the best."

(14) The Rev. Dr. Peters wrote thus to Mr. Barton, under the date of March 22, 1771—"Dr. Smith has done wonders in favour of our friend Rittenhouse. His zeal has been very active: he has got enough to pay him for a second orrery; and the assembly has given him 300*l*. The Doctor, in his introductory lecture, was honoured with the principal men of all denominations, who swallowed every word he said, with the pleasure that attends eating the choicest viands; and in the close, when he came to mention the orrery, he over-excelled his very self!"—"Your son will acquaint you with all the particulars respecting it. The lectures are crowded by such as think they can, thereby, be made capable of understanding that wonderful machine: whereas, after all, their eyes only will give them the truth, from the figures, and motions, and places, and magnitudes of the heavenly bodies."

hundred persons,⁽¹¹⁾ in small companies of ten or twelve, each : the satisfaction they universally express, makes however some amends.^{”(12)}

The *italicised* words, in the foregoing paragraph, have reference to a great domestic calamity Mr. Rit-

(15) The author of *The Vision of Columbus*, a Poem, (first published at Hartford in Connecticut, in the beginning of the year 1787,) alludes to the Rittenhouse-Orrery, and to the numerous resort of persons to the College-Hall, for the purpose of viewing that machine, in the following lines, (book vii.)

“See the sage RITTENHOUSE, with ardent eye,
Lift the long tube and pierce the starry sky ;
Clear in his view the circling systems roll,
And broader splendours gild the central pole.
He marks what laws th’ eccentric wand’ers bind,
Copies Creation in his forming mind,
And bids, beneath his hand, in semblance rise,
With mimic orbs, the labours of the skies.
There wond’ring crouds with raptur’d eye behold
The spangled Heav’ns their mystic maze unfold ;
While each glad sage his splendid Hall shall grace,
With all the spheres that cleave th’ ethereal space.”

(16) In a letter from Dr. Smith to Mr. Barton, dated March 23, 1771, is this paragraph :—

“ I have been so busy these two months past, that I could not find a moment’s leisure to write. A good deal of time was to be given to the public lectures, the Orrery, and the getting our dear friend Rittenhouse brought into as advantageous a light as possible, on his first entrance into this town as an inhabitant ; all which has succeeded to our utmost wishes ; and the notice taken of him by the province, is equally to his honour and theirs. The loss of his wife has greatly disconcerted him ; but we try to keep up his spirits, under it.”

tenhouse had experienced, only a very few months before,—the death of an affectionate wife, whom he tenderly loved. This afflicting event appears to have overspread, for some time, the highly sensible and delicate mind of our Philosopher, with a considerable degree of gloominess. In this mood, then, he thus commenced the letter just quoted: “*You are not unacquainted with the dismal apprehensions of losing what is most dear to you*” (alluding, here, to a dangerous fit of illness from which Mrs. Barton, the writer’s sister, had recently recovered;) “and therefore you can better judge, than I can describe, what I feel at present. I do, indeed, endeavour to bear my loss in the manner you recommend: but how irksome does every thing seem! Nothing interesting, nothing entertaining! except my two little girls; and yet my reflecting on their loss sinks me the deeper in affliction. What adds to my misfortune, is the hurry of business I am engaged in, and know not how to get rid of. My design, at present, is to keep the children with me, until I can conveniently take a ramble to Europe.” And, in the same strain of melancholy reflections, he concluded this letter to his friend and brother-in-law: “I suppose,” said he, “you have been informed, that the Assembly have made me a donation of three hundred pounds. This would have been very agreeable to me, if my poor Eleanor had lived: but now, neither money—nor reputation—has any charms; though I must still think them valuable, because absolutely necessary in this unhappy life.”

Although such was the keen sensibility of this amiable man, on so distressing an occasion, his numerous avocations of business and studies, aided by the correctness of his own reflections, gradually dispelled these over-shadowings of his dejected mind; and ere long, he very naturally regained his usual serenity and cheerfulness of temper.

A new phenomenon in the heavens soon after engaged his attention: this was the Comet which appeared in June and July, 1770. His Observations on this Comet, with the elements of its Motion and the Trajectory of its Path, were communicated to the American Philosophical Society, through his friend Dr. Smith, on the 3d of August, soon after the Comet's disappearance, and were dated at Norriton the 24th of the preceding month. The letter to Dr. Smith, that covered this communication, and in which he says, "Herewith I send you the fruit of three or four days labour, during which I have covered many sheets, and literally drained my ink-stand several times"—will demonstrate how completely his mind was occupied in those researches.

About the close of the following autumn, some accounts of Observations of this Comet in England and France, respectively, reached this country; when a further correspondence on the subject took place between Dr. Smith and Mr. Rittenhouse. These communications are published, entire, in the first volume

of the Philosophical Society's Transactions ; and, with those already noticed, complete the list of our Astronomer's papers in that volume. It is here worthy of remark, that a comparison of Mr. Rittenhouse's Observations of this Comet with those of M. Messier in France and Mr. Six in England, confirmed the theory of the American Observer.

Before this subject is dismissed, however, it may not be deemed uninteresting to subjoin an extract of a letter which Mr. Rittenhouse addressed to the Rev. Mr. Barton (from Norriton,) on the 30th of July, respecting the same Comet : it will, at least, serve to shew the zeal of our Astronomer, on the occasion.

“ I told you,” said Mr. Rittenhouse, “ that some intricate calculation, or other, always takes up my idle hours” (he seems to have considered all his hours as “ idle” ones, which were not occupied in some manual employment,) “ that I cannot find time to write to my friends as often as I could wish : a new object has lately engrossed my attention. The Comet which appeared a few weeks since was so very extraordinary, that I could not forbear tracing it in all its wanderings, and endeavouring to reduce that motion to order and regularity, which seemed void of any. This, I think, I have accomplished, so far as to be able to compute its visible place for any given time : and I can assure you, that the account from York, of its having been seen again near the place where it first ap-

peared, is a mistake. Nor is Mr. Winthrop of Boston happier, in supposing that it yet crosses the Meridian, every day, between twelve and one o'clock, that it has already passed its perihelion, and that it may, perhaps, again emerge from the Southern Horizon. This Comet is now to be looked for no where but a little to the North of, and very near to, the Ecliptic. It rises now a little before day-break; and will continue to rise sooner and sooner, every morning. Yet perhaps, on account of its smallness, we may see it no more; though I rather think we shall: But I must stop, for fear of tiring you."

The subjects of all Mr. Rittenhouse's philosophical papers, comprised in the first volume of the Society's Transactions, having been now noticed, some public acts connected with two of the objects to which those papers relate, and which took place about the time to which these memoirs are brought down shall, at present, be adverted to.

The Orrery had attracted a very general attention, among learned, ingenious, and well-informed persons, in this country: it could not, therefore, escape the notice of the then Legislature of Pennsylvania. Accordingly, the honourable testimony borne by that very respectable body, to the merits of Mr. Rittenhouse, is thus expressed in the Journal of the House, under the date of March the 8th, 1771.

“The members of assembly, having viewed the Orrery constructed by Mr. David Rittenhouse, a native of this Province, and being of opinion that it greatly exceeds all others hitherto constructed, in demonstrating the true Situations of the celestial Bodies, their Magnitudes, Motions, Distances, Periods, Eclipses, and Order, upon the principles of the Newtonian System :

“ *Resolved*, That the sum of three hundred pounds be given to Mr. Rittenhouse, as a Testimony of the high sense which this House entertain of his Mathematical genius and Mechanical abilities, in constructing the said Orrery. And a Certificate for the said sum, being drawn at the table, was signed by the Speaker and delivered to Mr. Evans.

“ *Ordered*, That Mr. Evans, Mr. Rhoads, Mr. James, Mr. Rodman, Mr. Morton, Mr. Carpenter, Mr. Montgomery, and Mr. Edwards, with the Speaker,⁽¹⁷⁾ be a Committee to agree with and purchase from Mr. Rittenhouse a new Orrery, for the use of the Public, at any sum not exceeding four hundred pounds, lawful money of this Province.”⁽¹⁸⁾

(17) Joseph Galloway, Esq. was then speaker.

(18) The committee, named in the above order of the general assembly, made the following report to that body, on the 24th of September, 1771; viz.

“ The committee appointed to agree with, and purchase from Mr. Rittenhouse a new Orrery for the use of the public, beg

Unfortunately, the important object designed to have been obtained "for the use of the Public," by the Order which closes this legislative resolution was not executed. This disappointment of the liberal intentions of the Legislature arose, probably, from the many and arduous employments in which Mr. Rittenhouse was almost constantly engaged, in the short period which intervened between that time and the commencement of the troubles in America. But, whatever may have been the cause, the consequence is much to be regretted.

In January, 1774, Mr. Rittenhouse was elected one of the Secretaries of the American Philosophical Society; and on the 22d of February following, an Address was presented to the General Assembly by that Society, requesting the acceptance, by each Member of the House, of the first volume of the Society's Transactions, then recently published. This Address, which was signed by order and in behalf of the Society, by Dr. Smith, Dr. Ewing, and Mr. Robert Strettel Jones, together with Mr. Rittenhouse, as the Secretaries, was favourably received by the Assembly.

leave to report, that they have, in pursuance of the order of assembly, agreed with Mr. Rittenhouse for a new Orrery, at the price of four hundred pounds, the price limited by the house; to consist of one principal square (face,) of eight feet or more each way, with two wings; making in the whole one large front, as nearly resembling the form of the Orrery now standing in the College of the city of Philadelphia, as its superior size will admit." (Signed by all the members of the committee.)

Some short time prior to this, viz. on the 22d of September, 1770, Dr. Thomas Bond and Samuel Rhoads, Esq. two of the Vice-Presidents of the American Philosophical Society, had, by their Order and in their behalf, transmitted to the General Assembly the Observations on the Transits of Venus and Mercury, then unpublished; not only those which had been made under the directions of that Society, but such as had, in the intermediate time, been received from the other American Colonies and from England: the Society expressing, at the same time, a due sense of the obligations they were under to the Assembly, "for the countenance and encouragement they had given them, in carrying on the designs of the Institution; and, that they were particularly thankful for the generous assistance granted to them, for making those Observations." They say further: "We have the pleasure to find they have been highly acceptable to those learned Bodies in Europe, to whom they have been communicated;" and, that they were "likely to be of great service, in settling that important point in Astronomy, which was proposed from the Transit of Venus."

It is evident from these proceedings, that there was, at that day, a reciprocation of good will between the Legislature of Pennsylvania, and a most valuable Scientific Institution, established within the bounds of their jurisdiction. While the legislative body, on the one hand, encouraged such institutions, and extended

a liberal patronage to persons of genius and useful talents; men of learning and abilities, on the other, were stimulated by a sense of gratitude, and a laudable desire of honourable fame, to exert themselves for the public welfare.

Among the Members of the then General Assembly of Pennsylvania, were John Dickinson, William Allen, George Ross, Edward Biddle, Charles Humphreys, John Sellers, John and Israel Jacobs, and James Wright, besides the very respectable characters named in the foregoing resolution and order of the House.⁽¹⁹⁾

(19) Messrs. Dickinson, Humphreys, Morton, Ross and Biddle, together with Mifflin and Franklin, were delegated on the part of Pennsylvania to the first general congress, which met in Philadelphia on the 5th of September, 1774; and the same gentlemen, with the addition of Messrs. Willing and Wilson, were also delegates from Pennsylvania in the second general congress, which met in the same city on the 10th of May, 1775. Of these "dignified and ever memorable assemblies," composed of that "industrious band of patriots whose worth sheds a lustre on the American character," the great Washington was also a member.

Mr. Dickinson, the writer of the celebrated *Farmer's Letters*, was a distinguished lawyer, statesman and scholar. Dr. Ramsay (who published his *History of the American Revolution* at the close of the year 1789,) remarks, that "the stamp-act, which was to have taken place in 1765, employed the pens and tongues of many of the colonists," and, that "the duties imposed in 1767, called forth the pen of John Dickinson, who in a series of letters, signed '*A Pennsylvania Farmer*,' may be said to have sown the seeds of the revolution."

From the commencement of the momentous controversy between the North-American colonies and the parent state, Mr. Dickinson was an able and strenuous assertor of the rights of the

The various agitations which the public mind underwent in this country, in the succeeding four years,

colonists. In the summer of the year 1768, the Rev. Mr. Barton sent him a little artificial fountain or jet-d'eau, called a perpetual fountain, prettily contrived and ornamented. On that occasion, the patriotic feelings of Mr. Dickinson were thus expressed, in an handsome allusion to this engine; feelings, called forth by some sentiments contained in the letter which accompanied this small present,—“I wish” (said he, in his answer to Mr. Barton’s letter, dated the 29th of August,)—“I wish ‘a perpetual fountain’ may water the tree of American liberty—I shall always be ready and willing, with pious hands, to sprinkle its roots; even though, for every drop of the pure element I throw upon them, the free-booters should pour upon me all the foul waters in which they delight to dabble. I have acted from the best of motives, the love of freedom and of my country. If reproaches can influence the weak and malicious, they never can blot from my memory the pleasing consciousness of having endeavoured to do my duty. I am extremely sensible of my own frailties; and yet I think I have so much charity, that I reflect with pleasure, that perhaps these very people who abuse me, may derive some little advantage from those very actions of mine for which they abuse me. May heaven grant this to be the case! It is all the revenge I desire to take of them; and this I think, my good sir, is a Christian revenge.”

Messrs. Allen, Ross, and Biddle, shall be noticed in another place.

Mr. Sellers was a sensible and ingenious country-gentleman, possessed of some skill in mathematical and astronomical science. Messrs. John and Israel Jacobs (whose sister was the second wife of Mr. Rittenhouse) were also well-informed country-gentlemen: the former was speaker of the general assembly of Pennsylvania, and the latter a member of congress, after the revolution. Mr. James Wright was a very respectable representative of the county of Lancaster, before the revolution. The gentlemen named in the committee of the general assembly, to treat with Mr. Rittenhouse for the purchase of an Orrery for the use of the public, were likewise conspicuous for their worth. Of

in consequence of its disputes with the parent state, and until the commencement of hostilities between the two countries, seem to place Mr. Rittenhouse more out of view for some time, with respect to any public employments. Then, all classes of people appeared to have become Politicians. The interests of Literature were neglected; Science, abstracted from Politics, was little cultivated; and all other considerations were, in general, apparently absorbed in the views which the American people entertained of their public affairs, and in the prosecution of measures, adapted either for the obtaining a redress of the then existing grievances, or to meet the possible contingency of an adverse event. There was, in fact, for about four years preceding the year 1775, a great interruption, sometimes an almost total suspension, in the American colonies of Great Britain, of all pursuits, except the ordinary and indispensable ones of Industry and Commerce. Yet about the commencement of this period, (viz. in the summer of 1771,) Mr. Rittenhouse was engaged with Mr. Kinnersley and some other gentlemen, several days successively, in making a series of experiments at Philadelphia, on the *Gymnotus Electricus*, or Electric Eel; for the purpose of ascertaining the nature of the faculty by which this fish is enabled, on being touch-

these, Mr. Rhoads was one of the vice-presidents of the American Philosophical Society, and Mr. Morton, a judge of the supreme court of Pennsylvania, before the revolution: both were afterwards members of congress.

ed, to impart a shock, very similar in sensation to that produced by the electric fluid. An account of these experiments was long afterwards communicated by Mr. Rittenhouse to Professor Barton of Philadelphia, and will be found in the first volume of his *Philadelphia Medical and Physical Journal*.

It was during this interval that Mr. Rittenhouse experienced a long course of exemption from any very conspicuous public employments, which could interfere with his favourite studies; an interval, in which he was disposed to have enjoyed a kind of dignified leisure, amidst the tranquillity of domestic employments; so far as the existing state of things in the political world would permit a man, solicitous for his country's happiness, to participate in any sort of gratification, that might be deemed incompatible with a due degree of interest in the public weal. He possessed too enlightened and patriotic a mind not to be keenly sensible of the delicate, as well as alarming situation, in which his country was then placed. But nature had fitted him for the quiet station of domestic life, and the delightful pursuits of natural science; rather than for the bustle of official situation, and for those speculative projects in politics, wherein specious theories often terminate in the most deceptive results.

He had been investigating principles founded in Truth, from his childhood; this object was always near to his heart; and he set little value on any thing

that did not lead to its attainment. This predominant disposition of his mind is indeed plainly evinced by a single sentence, contained in a letter which he addressed to Mr. Barton, so early as the 16th of February, 1764. Having had a personal interview with an eminent and worthy clerical gentleman, well disposed to befriend him, but who was more a metaphysical than a natural philosopher, he thus expressed himself on the occasion : " I had a good deal of conversation with Mr. * * * * *, not, perhaps, greatly to the satisfaction of either of us ; for he appears to me to be a Mystical Philosopher, and you know I care not a farthing for any thing but sober Certainty in Philosophy."

- ✓ Fifteen years elapsed between the publication of the first and second volumes of the Transactions of the American Philosophical Society ; and there is an interval of about ten years between the latest of Mr. Rittenhouse's communications, contained in the first volume, and the earliest in the second. These facts, alone, are sufficient to demonstrate to what a state of depression all philosophical pursuits had sunk, not only during the war of the revolution, but for some years preceding it. It is true, that long before the close of that war, an attempt was made by a few individuals to revive the long interrupted meetings of the Society, at the stated times of their convening ; and that, for this purpose, a Charter of Incorporation was granted to the members of that Institution, by an act of the

Pennsylvania Legislature, passed the 15th of March 1780: but that act itself contains an acknowledgment of the truth, that, "The Society, after having been long interrupted in their laudable pursuits by the calamities of war and the distresses of our country," had "found means to revive their design,"—"in hopes of being able to prosecute the same with their former success."

But, at the date of Mr. Rittenhouse's letter to Mr. Barton, of the 3d of February, 1772,⁽²⁰⁾ he appears to have been chiefly engaged in his domestic concerns and professional employment. He remained, even then, very sensible of the loss he had sustained in the death of his wife: and his reflections on that circumstance, together with the serious aspect of the times and his frequent indisposition, depressed his mind, occasionally, much below its natural state of cheerfulness. It must have been in one of these hours of mental gloom, that he penned the succeeding passage, in the letter last referred to.

"I do not doubt, my dear Brother, but that you condemn me, as usual, for not writing: but much writing ill suits a Mechanic. After the comfortless toil of the day, when evening comes, I am glad to sooth my mind with a favourite poet, or some other book of amusement. That you may not be disap-

(20) See Note 23.

pointed, I would have you to expect nothing of me, in future. I no longer feel any inducement to exert myself: every thing—even life itself—is insipid. Yet you will be told, I suppose, that I am paying my addresses to some one :—I sincerely wish sad experience may never teach you to reconcile these contradictions.”

“It is still my intention to go to England, as soon as my business will permit. I have had my health as well as usual, until the last fortnight; but have now a violent cold.”

The tenor of this quotation manifests, that our Philosopher did not, at that time, enjoy his accustomed serenity of mind. Some of the causes of his depression of spirits appeared to his friend and correspondent to be of such a nature, as might, perhaps, be removed by a little pleasantry. Under this impression, Mr. Barton, in his answer, thus rallied him :

“I am extremely sorry,”—said this gentleman, after replying to some other parts of Mr. Rittenhouse’s letter—“to find your Ambition so low, as to render you indifferent to that *Fame* to which you might justly aspire; and your Spirits so sunk, as to put you out of humour with the world. My dear Brother, what can this be owing to? You have, indeed, received a severe blow: but I am sure that your Philosophy has taught you, with the Poet,—that,

“To be from all things that disquiet, free,
Is not consistent with Humanity.”

"Your case is not singular ;—nay, it is favourable in comparison with that of thousands. Though you have been deprived of one comfort, yet many have been continued to you ; such as, a tolerable share of health—your children—the means of subsistence—the esteem of your friends—the applause of your countrymen, &c. &c. Banish therefore, I beseech you, this serious sadness—these melancholy reflections ; which, if *Dr. Cadogan*⁽²¹⁾ is to be credited, must be more injurious to your health than any other cause can be."

"I know not, indeed, what kind of *Melancholy* yours can be. To use the words of the immortal Shakespeare,—

"You have neither the Scholar's Melancholy,
Which is Emulation ; nor the Musician's,
Which is fantastical ; nor the Courtier's,
Which is Pride ; nor the Lawyer's, which is politic ;
Nor the Lady's, which is nice ; nor the Lover's,
Which is all these : but it is a Melancholy
Of your own,—compounded of many simples,
Extracted from many objects,—and, indeed,
The sundry Contemplation of the"—STARS.

"If you will promise to pardon your saucy niece, I will tell you what she attributes it to. She says

(21) Dr. William Cadogan's "Dissertation on the Gout and all Chronic Diseases," &c. made its appearance in America about that time ; and the Rev. Mr. Barton, who had long experienced an hereditary gouty affection, then thought favourably of the Doctor's general theory, although he could not adopt that ingenious theorist's doctrine, denying the existence of any hereditary diseases.

you are in *Love* ; and, really, you seem to insinuate as much, yourself : If it be so, I sincerely wish you success in your “ Addresses ;” or a happy deliverance from the effects of Love.”

“It would give me great pleasure to hear, that you had fairly resolved upon going to England;⁽²²⁾ because it would be the means not only of cheering your spirits, but of establishing your interest as well as reputation. You give me some hopes of seeing you soon : your Sister and I would be extremely glad, indeed, to see you at Lancaster.⁽²³⁾”

(22) Mr. Barton and some others of Mr. Rittenhouse’s friends had repeatedly recommended to him to visit England : the former, particularly, often urged him to it, and for the reasons assigned in the text. That he had, himself, long contemplated that voyage, is apparent from the extract of his letter to Mr. Barton, of the 15th of March 1771, already quoted ; and his last mentioned letter to the same gentleman shews, that, nearly a year afterwards, he still had that object steadily in view.

(23) In a preceding letter, Mr. Barton had sent him some Mathematical Problems, for solution. These had been furnished by a schoolmaster, in Mr. Barton’s neighbourhood ; who, although reputed a pretty good mathematician, possessed but a small share of genius or invention, while he had a large portion of confidence in his own abilities. In noticing these problems, Mr. Rittenhouse could not refrain from shewing some little irritation : he thought the communications too trifling, too destitute of originality, or too useless, to merit his attention ; and, accordingly, he thus expressed himself on the occasion, in a letter dated Feb. 3, 1772 :

“I entreat you not to insist on my measuring heads with any pragmatical schoolmaster, who is heartily welcome, for me, to

Although no doubt can be entertained, that, in the early part of the year 1772, Mr. Rittenhouse had it very seriously in contemplation to visit England, as soon, to use his own words, as his business would permit, his intention in that particular was eventually frustrated : but it is now uncertain, to what cause was owing a change of his views or the disappointment of

divert himself with his *x. y. z's*, at which he may be very expert, and yet be, as you say, both ignorant and conceited. His first question, however, may be answered by any young algebraist : the second and third are more difficult, and will admit of various answers. The fourth contains four observations, picked out, (and carelessly enough, several of the figures being wrong,) of a set made on the comet of 1682, which I shewed your son William in about half a dozen different books; you will find them in Dr. Halley's Astronomical Tables. Every thing relating to this comet has long ago been settled by Dr. Halley; so that, to give a complete answer to the question, I need only transcribe from him : but you cannot conceive how much I despise this kind of juggle, where no use is proposed. If your schoolmaster will give me but three good observations (I do not want four) of the comet of 1769, I will accept them with thanks, and soon undertake the laborious task of determining its orbit, which we yet know nothing about."

To this Mr. Barton replied, in a vein of good-humoured pleasantry :

" I imagine you have mistaken me, with regard to the mathematical questions. They were not sent as trials of your abilities : but, for reasons with which W. B. is acquainted, and which I have desired him to give you, in order to afford you a laugh. I shall never "insist" on your "measuring heads" with a "schoolmaster," of any kind; because I know full well, already, that your head is longer than all the heads of the whole tribe. Had you known what diversion your solutions would have afforded me, you would have sent them."

his plan.⁽²⁴⁾ He married, however, in the month of December following, Miss Hannah Jacobs, of the city of Philadelphia.⁽²⁵⁾

By an act of the legislature of Pennsylvania, passed the 26th of February, 1773, Mr. Rittenhouse was appointed one of the Commissioners for making the river Schuylkill navigable ;⁽²⁶⁾ and by two subsequent laws, passed on the 24th of March, 1781, and the 15th of March, 1784, he was again appointed a Commissioner, at those two periods, for the same purpose. And by a list of the incidental expences of the government, for the first mentioned of those years,

(24) It is not improbable, that about the time of writing the letter of the 3d of Feb. 1772, from which extracts are given in the text, he began to think seriously of marrying again. Both his natural disposition and his habits endeared to him the comforts of domestic society ; and these he could not enjoy in a single state, his two only children being infants. He therefore married, in December 1772 ; at which time he was only in the forty-first year of his age. The lady he chose as his companion, was a sensible, prudent and valuable woman ; whose family were members of the religious society of Friends, and with whose brothers Mr. Rittenhouse had long been intimately acquainted. By that marriage there was but one child, a daughter, who died in her infancy. Mrs. Rittenhouse survived her husband little more than three years. She died in October, 1799.

(25) See the preceding note.

(26) The first law of Pennsylvania, for removing rocks, sand-bars and gravel, from the bed of the river Schuylkill, so as to render it passable with rafts, boats, and other small river-craft, was passed the 14th of March 1761.

it appears that he received **41l. 15s. 11d.** for his services in that business. In these several appointments of commissioners, during a term of eleven years, Mr. Rittenhouse was uniformly first-named; and, consequently, became president of their board.

The last important business of a public nature, in which Mr. Rittenhouse was engaged, prior to the American war, was in fixing, jointly with a Commissioner on the part of New-York, the beginning of the 43° of North latitude, and to establish a Line, thence Westward, as the Boundary between Pennsylvania and New-York.

Mr. Rittenhouse was appointed the Commissioner for this purpose, on the part of the then province of Pennsylvania, by Gov. John Penn, on the 24th of October, 1774; and Samuel Holland, Esquire, was the Commissioner on the part of New-York, appointed by Lieutenant-Governor Colden. As Captain Holland's⁽²⁷⁾ commission was not made out until the 8th

(27) Mr. Holland was an able engineer in the British service, and held the military rank of captain.

In September 1772, the Philosophical Society announced in the public prints, the receipt, by them, of sundry communications: among which were various astronomical observations, made in Canada, by this gentleman and two other military officers, from June 1765, to May 1770, (captain Holland being, at that period, surveyor-general of the district of Quebec.) These observations were communicated to the society by Mr. Rittenhouse; but, having been received after the first volume of the Society's Transactions was published, their publication in the subsequent volumes was by some means omitted.

of November, these Joint-Commissioners could not proceed on the business of their appointment, before that late period. It appears, however, by the duplicate returns made by these gentlemen to their respective governments, under the date of December the 14th in the same year, that they "ascertained and fixed the beginning of the forty-third degree of North latitude on the Mohawk or Western branch of the Delaware; and there, in a small island of the said river, planted a stone, marked, &c."⁽²⁸⁾ — "but that the rigour of the season prevented them from proceeding further in running the said line, &c."⁽²⁹⁾

612 This Line remained thus unsettled, until after the conclusion of the American war. Mr. Rittenhouse and Captain Holland having previously established the North-Eastern Corner of Pennsylvania, on that boundary, by ascertaining and marking thereon the beginning of the 43° of North latitude, the Pennsylvania Legislature, on the 31st of March, 1785, enacted a law, authorizing the Executive of the State to appoint a Commissioner, in conjunction with one or more on the part of New-York, to run and complete

(28) The Marks, &c. are particularly described in the Pennsylvania Act of Assembly, passed the 29th of Sept. 1779, entitled "An Act to establish and confirm the Boundary Line between this state and the state of New-York."

(29) The Law, referred to in the preceding note, states the extent of their further progress in the business at that time, which was inconsiderable.

the Line. The person selected for this service by Pennsylvania, in addition to Mr. Rittenhouse, was Andrew Ellicott, Esq. an able Mathematician and Astronomer, and well qualified also, by his practical knowledge of Surveying or Land-Mensuration: this gentleman was accordingly commissioned⁽³⁰⁾ by the

(30) Although Mr. Ellicott's commission bears date the 16th of June, 1786, his appointment took place some months sooner. On the 3d of April, in that year, Mr. Rittenhouse wrote him thus:—

“ Dear Sir,

“ By direction of Council” (the Supreme Executive Council of Pennsylvania,) “ I wrote some time ago to the gentlemen appointed by the state of New-York for running the northern boundary of this state. I have received their answer; which is, that they will meet us at Philadelphia on the 20th of this month, in order to concert measures for carrying that business into execution. It will be necessary for you to attend, and I shall confidently expect you—’till then, I must defer many things I have to say to and settle with you: perhaps copying the Nautical Almanack may wait until I see you. Hurry of business will not permit me add more, than that I am,

Dear Sir,

Your very humble serv’t.

DAV. RITTENHOUSE.”

“ ANDREW ELLICOTT, Esq.
Baltimore.”

And on the 29th of September, in the succeeding year, he addressed another letter on the subject of this boundary, to Messrs. Ellicott and Porter, jointly; wherein he says:

“ Your packet came safe to hand, about three weeks after the date of the letters. I am much obliged to you for the intelligence it contains; you have succeeded beyond my expectation, and I have no longer any doubt of your completing the line this season. I should have been glad, if, to the account of your work,

hon. Charles Biddle, Esquire, then Vice-President of the Supreme Executive Council of Pennsylvania, on the 16th of June, 1786.⁽³¹⁾ The Commissioners on the part of New-York, were James Clinton and Simeon De Witt, Esquires: And by these gentlemen, appointed on behalf of their respective governments, this business was prosecuted; but it was not then completed.⁽³²⁾

you had added some description of the country : but my curiosity must wait till your return."

Mr. Rittenhouse continued in commission, for the establishing of this line, until its entire completion: but his non-attendance with the other commissioners in the actual running of the line, in the year 1787, was prevented by his being then engaged in fixing the territorial boundary between the states of Massachusetts and New-York. In the letter, last quoted, is this paragraph:—"Dr. Ewing and myself were absent seven weeks, on the line between New-York and Massachusetts, in which time we happily completed it, to the satisfaction of all parties; and, with this business, I have bid adieu, forever, to all running of lines."

(31) Dr. Rush has been led into a mere mistake of the date on this occasion; probably, by an hasty perusal of the confirmatory law, of Sept. 29, 1789. He states, in his eulogium, that it was the year 1786, in which Mr. Rittenhouse "was employed in fixing the northern line which divides Pennsylvania from New-York: his services on that business were originally employed in 1774. He did, indeed, again act as a commissioner, in the year 1786, and it was on the 16th day of June, in that year, that Mr. Ellicott was commissioned to complete, in conjunction with Mr. Rittenhouse, what the latter had begun to execute eleven years and an half before the last mentioned date.

(32) "In order to carry on the parallel of latitude with as much expedition and economy as possible," says Mr. Ellicott,

The following letter, addressed by Mr. Rittenhouse to his wife, while he was engaged in this service, will not only furnish the reader with some idea of the manner in which the commissioners, with their attendants, were obliged to live in the wilderness, and the nature of their accommodations ; but it will also present him with an interesting little story, illustrative of the manners and condition, in our day, of some of that unfortunate race of men, who were once the independent lords of that vast territory, over which the descendants of a grant transatlantic people now exercise all the rights of sovereignty and ownership. This letter is dated the 6th of August, 1786.

“It is,” says Mr. Rittenhouse, “six long weeks since I have had the happiness of seeing you or hearing from you ; and this is the first opportunity I have had of conveying a letter to you, since I left Wyoming. As I cannot hope to receive a line from you until we approach nearer to the habitable world, my next great-

“we dispensed with the method of tracing a line on the arc of a great circle, and correcting into the parallel ; as pursued by Messrs. Mason and Dixon, in determining the boundary between this state” (Pennsylvania,) “and the state of Maryland, and which we followed in completing their line in the year 1784. We commenced our operations by running a guide-line, West, with a surveying compass, from the point mentioned on the Delaware” (the one which was fixed by Dr. Rittenhouse and Capt. Holland, in the year 1774,) $20\frac{1}{2}$ miles ; and there corrected by the following zenith lines” (laid down in the sequel,) “taken, at its western termination, by a most excellent Sector, constructed and executed by Dr. Rittenhouse.”

H h

est pleasure is to inform you of the favourable state of my health : this pleasure is indeed damped in some degree, by my fears that you will not give full credit to what I say, though I mean to abide strictly by the truth. The head-ach has been unknown to me, almost ever since I left you ; my cough, though much better, is not quite removed ; and I have no other complaint, except that which will never leave me in this world : this, however, far from being worse than usual, is certainly something less troublesome ; which I attribute to my being more at liberty to use moderate exercise, and less exposed to summer heats than I should be at home. This seems to be a different climate from that you are in ; the weather is constantly cool, but not cold. We are at present situated on a pleasant bank of the Susquehanna, about fifteen miles above the mouth of the Chenango, one of the principal branches of this river. From this place to Middletown in Lancaster county, is, by estimation, 270 miles along the river : much of the road is very bad, so that we had a tedious journey.

“At Chenango, there are a few Indian families settled, amounting to forty souls. Some of these people frequently visit us, and bring us fish and venison ; in return for which, they are very desirous to have flour or salted provisions : and we live in the greatest harmony with them. Five or six days ago, one of the Onondago Sachems with his family came up in three canoes, and encamped in the evening, just below us.

Next morning, we received a message from them, requesting an audience for two young ladies of the family. To this, a proper answer was returned, (General Clinton having prudently brought an interpreter with him,) and at the time appointed they were introduced to us in our tent, unattended by any other Indians. After a draught of punch, and a decent silence, our visitors were told that we were ready to hear what they had to say. The eldest of the two, a fine girl of about twenty, and extremely well dressed, with a becoming modesty made a short speech; concluding with an handsome apology for acquitting herself no better, on account of her youth and sex. The purport of her speech was, that thinking it would not be disagreeable to us, they were come to spend a few days in our company: that they were poor, and in want of provisions, especially flour; and hoped we would furnish them with a small portion of our stores,—at least for present use, whilst they staid with us. We encouraged them to bring us fish and other fresh provision; in return for which, they should have salt meat and some bread. Business being over, some cheerful conversation ensued: and we had reason to think our interpreter went much farther than he was warranted to do; for he made some proposition which the young lady negatived strongly, though we are ignorant of what it was. He was then bid to assure them, that no insult should be offered, and that they might visit us at our tents whenever they pleased: to this one gentleman

added, that we would treat them as we would our own country women.

“It seems the old interpreter mistook the word *treat*, and construed it, the *giving them victual and drink*: in consequence of this mistake, the ladies expected to dine with us every day. They then departed, seeming well satisfied; but in the afternoon we received a message from them, complaining that we had already broken the treaty, in not sending for them to dinner. To this we sent a verbal answer, with an apology, and letting the ladies know we should expect them to tea. To my great surprise, we then received a written note, thanking us for our kindness and promising to drink tea with us,—signed, *Jacowe and Sally*: it was in the Indian language, and written by Miss Sally herself. We now thought it our duty to return a written compliment likewise; and this intercourse ended with a verbal message from Miss Sally, assuring us, that she thought herself honoured by our letter and would carefully preserve it. The ladies did not fail to come; and have drank tea every day, and sometimes dined with us. They are cheerful and agreeable; but cannot, or will not, speak one word of English. Mr. De Witt draws prettily, and is taking a very good picture of the young princess, which I hope to have the pleasure of shewing you in a few weeks. I have mentioned their *writing*, which you will be surprised at: but these Indians are in some measure civilized; many of them have learned to read;—they have the

Common Prayer Book of the Church, printed in their own language, which is the Mohawk.⁽³³⁾ The family now with us have several books with them; likewise paper, pens and ink. Every evening, the females jointly sing several religious hymns, and their music is at least equal to any of this kind I have heard: the old mistress is very devout, and sometimes says her prayers with great fervency. They are, nevertheless, still but Indians; and Miss Sally will sit, with all her finery about her, flat on the ground for hours together, under a miserable bark shed, making buckskin shoes, until her eyes are almost smoked blind; then, by way of relaxation, she and her cousin will step into a little tottering canoe, where, standing upright, they row away with incredible swiftness.

“You will excuse me for entertaining you so long with an account of these poor wretches. But your news, and your politics, are almost forgotten. Still, my principal happiness is, that not only waking but frequently in my dreams, I feel all that esteem and affection for you, which I hope will never end. My companions

(33) The Liturgy of the Church of England was first translated into the Mohawk language, in the year 1714. Another translation was made under the direction of three clergymen of that church; namely, the Rev. Mr. William Andrews, Dr. Henry Barclay, and Dr. John Ogilvie: This was printed in the year 1769; but the place where it was printed does not appear. In the year 1787, an handsome edition of the English Book of Common Prayer, with a translation into the Mohawk language by captain Joseph Brant, was published in London.

are agreeable enough; but as every one has his own humours, it is by no means a desirable thing to be cooped up in a little tent, night and day, for weeks together, with any one. I want something to employ my leisure hours. This I could do by writing, but here is no privacy: I am at present obliged to write badly and in a small hand, to prevent its being overlooked. I cannot think of taking my departure for Philadelphia, until we approach nearer the inhabited country: our next station, but one, will be at or near Tioga, and from thence I shall return."

* * * * *

"God grant you health and spirits," &c.

In 1787, Mr. Ellicott's associates, in completing this line, were Col. Andrew Porter of Pennsylvania, and Abraham Hardenberg and William Morris, Esquires, of New York; Mr. Rittenhouse, who was engaged the same year in a similar occupation, being unable to attend the finishing of this boundary. It was then finally run and marked, by the other commissioners here named; and, in conformity to the return of these commissioners, their proceedings were ratified by a confirmatory law of Pennsylvania, passed on the 29th of September, 1789.

Thus did the labours of a great work,—of one which employed the talents of Mr. Rittenhouse to-

wards the close of the year 1774—which were resumed by him, in 1786, and were afterwards continued and completed by Mr. Ellicott and his associates,—receive the legislative sanction of Pennsylvania, fifteen years after the commencement of this arduous undertaking.

His studious habits, and zealous investigation of the works of nature, led Mr. Rittenhouse to devote as much of his time, as the delicate state of his health permitted him to retrench from occasional public employments and his private occupations, to those objects for the promotion of which the American Philosophical Society was instituted. After he fixed his residence in Philadelphia, the established seat of that Society, he attended their Meetings pretty regularly; and by that means had an opportunity of forming a more intimate acquaintance with many persons, most conspicuous, at that time, for talents, knowledge, and learning. His great abilities had then become almost universally known; and these, in connexion with the suavity of his deportment, his great modesty, and exemplary moral character, had not only procured him the esteem and respect of all good men; but confirmed the friendship of his old acquaintances, and attached to him the high and sincere regard of many new ones.

As one instance, among many, of the distinguished estimation in which Mr. Rittenhouse was held by his fellow-citizens, after a residence of between four and

five years in Philadelphia ; the American Philosophical Society petitioned the legislature, on the 6th of March, 1775, for pecuniary aid, to enable them to erect an Observatory ; and to allow Mr. Rittenhouse an annual salary, as the "Public Astronomical Observer."

The objects of this application were important, in a public view ; and its whole tenor was alike honourable to the enlightened patriotism of the Philosophical Society, and the merit of the person to whom, more particularly, it had reference.⁽³⁴⁾ Indeed, such a public act of so respectable a body as that society, is a testimonial reflecting great honour on the character of Mr. Rittenhouse ; insomuch, that it would be doing injustice to his memory, not to insert it in these Memoirs of his Life. It is as follows :

"To the honourable the Representatives of the Freemen of the province of Pennsylvania, in General Assembly met :

"The Representation and Petition of the American Philosophical Society, held at Philadelphia, for promoting useful knowledge.

(34) Mr. Rittenhouse is not mentioned in the petition, by name. This was unnecessary : for it was universally known, that it could apply to no other person in America, so unquestionable and pointed are its allusions to him ; and that, perhaps, no other Astronomer then living, so well merited the high encomiums on his philosophical abilities, which it contains.

“Gentlemen,

“It must yield a sensible satisfaction to the good people of this province, whom you represent, to find, that although it be among the youngest of our American settlements, its reputation has risen high among the sister colonies, and has extended even to the remotest part of Europe, on account of our many public-spirited institutions, and our rapid improvements in all useful arts. This satisfaction is also greatly increased, when we consider, that notwithstanding these institutions, through the necessity of the case, were generally obliged to derive much of their first support from the benevolence of individuals; yet a liberal spirit, for their encouragement and final establishment, has gone forth among our Representatives, in proportion to the increase of our provincial funds. And indeed the savings of public money, after supplying the exigencies of the state, are never more laudably directed, than towards the promoting whatever is useful and ornamental in society.

“It is with unfeigned gratitude that your petitioners recollect the repeated occasions you have given them, of acknowledging your bounty and protection, in carrying on their designs ‘for the advancement of useful knowledge;’ and it is their firm resolution never to abuse your former indulgence, by any future unnecessary or unimportant applications. By the means now in their own power, they hope, in ge-

neral, to be able to prosecute their plan; except so far as they may sometimes find it incumbent on them humbly to suggest to you the encouragement of useful inventions, and the patronizing undertakings beneficial to the whole community: And it is in this last view, that they presume to address you at this time.

“Amidst the variety of fields, which, in this new world, lie open to the investigation of your petitioners, they have, for several years, turned their views towards one, wherein they hope to gather some of their chief laurels, and to make discoveries alike honourable to their country and themselves. Our distance from the chief Observatories in the world, the purity and serenity of our atmosphere, invite us, nay loudly call upon us, to institute a series of regular Astronomical Observations; the comparison of which with those made in Europe, and elsewhere, might settle some very important points, and contribute greatly to give a last perfection to Geography and Navigation. The advantages derived to those noble and useful sciences, from such observations, are so obvious, that there is scarce a civilized nation in the world that has not made some provision for prosecuting them; and your petitioners have been honoured with repeated solicitations from some of the greatest men in Europe, to join with them in this great work, and in a mutual communication of our labours.

“It would be inexcusable, therefore, in your petitioners to neglect the present opportunity of endea-

vouring to set such a design on foot, when we have a Gentleman among us, whose Abilities, speculative as well as practical, would do Honour to any Country, and who is, nevertheless, indebted for bread to his daily toil, in an occupation the most unfriendly both to health and study. Under his auspices, the work may now be undertaken with the greatest advantages; and others may be bred up by him, to prosecute it in future times: but if the present opportunity is neglected, perhaps whole centuries may not afford such another. To rescue such a Man from the drudgery of manual labour, and give him an occasion of indulging his bent of genius, with advantage to his Country, is an Honour which crowned heads might glory in,—but it is an Honour also, which it is hoped, in the case of a native, Pennsylvania would not yield to the greatest prince or people on earth!

“The design, which your petitioners have projected, and now humbly beg leave to lay before your honourable House, is as follows, viz.

“First, That the Honourable Proprietaries be petitioned to grant a Lot of Ground, for erecting a Public Observatory, and to give such other encouragement to the design as they may think proper. And from their known attachment to the interest of this country, as well as their professed readiness to serve the Gentleman who is proposed to conduct the design,

your petitioners cannot have any doubt of their kind compliance with this humble request.

“ Secondly, That the assistance of your honourable House be requested, agreeably to the concluding prayer of this petition.

“ Thirdly, That a subscription be promoted for erecting a Public Observatory, and furnishing it with such instruments as may be wanted, in addition to those valuable ones now in the province. Of the success of this subscription among our benevolent fellow-citizens, there can be no doubt; and the expense of the additional instruments will not be great, as the Gentleman proposed to conduct the design, is capable of constructing them all with his own hand, in the most masterly manner.

“ Fourthly, That the Observatory shall be at all times open to the curious; and, particularly, that captains and mates of vessels, and young gentlemen desirous of obtaining a practical knowledge in Astronomy, shall have admittance, and (under proper rules, to be framed for that purpose,) be taught the use of Instruments, and the method of making Observations, especially the *new method* of ascertaining the longitude at sea; for the perfecting of which, the Parliament of Great Britain has of late given such ample rewards, to the singular advantage of trade and navigation.

“Fifthly, That the Observations to be made by the Public Observer, shall be annually published, under the inspection of the American Philosophical Society, and communicated to the learned Societies in Europe, with such remarks as may render them generally useful and entertaining.

“Sixthly, That the same person might also be appointed Surveyor of the high roads and waters; in order that when any public proposals are to be made, for improving navigation, and shortening the communications between capital trading places, there be always a person who has leisure, and is skilled in measuring and reducing distances, taking heights and levels, and who may be employed in conjunction with others, when necessary, to make report on all such matters, either at the expence of those who request such service, or at the public expence, as the case may require.

“Your Petitioners therefore humbly pray, that your Honourable House would take the premises into your consideration, and allow a yearly salary for such person, at least as a Public Astronomer, if you should not view the additional office of Surveyor of the high roads and waters in the same important light as it is viewed by your petitionors; and they further pray, that you would give them leave to bring in a bill for the legislative appointment of such Public Observer,

and for regulating his duty in the execution of his trust : and your petitioners shall ever pray, &c.

Signed in behalf and by order of the American Philosophical Society, at Philadelphia, March 6th 1775.

THOMAS BOND, V. P.⁽³⁵⁾

Nothing was done, in pursuance of this application to the legislature; although there is not any reason whatever to doubt, that there was the most favourable disposition in that enlightened and liberal assembly, to promote the laudable views of the Philosophical Society, both as they regarded the public interest, and the personal advantage of Mr. Rittenhouse. But the period was then close at hand, and its arrival had been for some time before anticipated, when the public voice was expected to proclaim, in a tone of awful solemnity, "*Cedant Armis Togæ*:" and, in fact, the calamitous appeal to arms which soon after succeeded, seemed almost wholly to absorb all other considerations, than such as were connected with the defence of the country and a new organization of its internal polity.

Mr. Rittenhouse was among those, who early yielded to the call of their fellow-citizens to serve them in

(35) Joseph Galloway and Samuel Rhoads, Esq's. the other vice-presidents of the society, were then members of the general assembly; and Dr. Franklin, the president, had not at that time returned from England. Mr. Rittenhouse was, at the same time, one of the curators of the society; as he was, also, during the year 1772.

a civil capacity. Dr. Franklin and Major (afterwards General) Mifflin had been respectively appointed by the continental congress, in the year 1775, to be post-master general of "the United Colonies of North-America," and quartermaster-general of the American army: and, in consequence of these appointments, both these gentlemen resigned, in the early part of the ensuing year, the seats they had occupied in the general assembly of Pennsylvania, as burgesses for the city of Philadelphia. To supply this vacancy in the representation of that city, Colonel (afterwards General) Joseph Reed and David Rittenhouse, Esq. were elected, in March 1776. Mr. Rittenhouse took his seat on the 5th day of the same month, and continued an useful member of that body until the termination of its legislative functions. But, although he was a valuable and highly respectable member of that house, he did not possess that species of talent which often enables a man of even moderate abilities, to make a prominent figure in popular assemblies: his perception was extremely quick; in deliberative powers he excelled; and all his reasoning faculties were most accurate: yet, an insuperable native diffidence—pursuits which precluded opportunities of public speaking—and, perhaps, a peculiar structure of his mind—all forbad his being an orator.

Notwithstanding the agitating and highly important public events which occupied men's minds, in the memorable year 1776, Mr. Rittenhouse could not en-

tirely abandon, even then, his darling pursuits. His ardent attachment to the Newtonian philosophy led him, on various occasions, to vindicate it against new-fangled theories which sometimes appeared against it : for there still remained a few speculative men, and, among these, some persons of considerable learning, who continued to adhere to the visionary principles of Descartes and his followers.⁽³⁶⁾ Of this, an instance occurred in the

(36) That eminent mathematician and astronomer, Mr. Roger Cotes,* in an excellent preface to his edition of Sir Isaac Newton's *Mathematica Principia Philosophiæ Naturalis*, has explained the true method of philosophising; shewn the foundation on which the Newtonian system was built; and refuted the objections of the Cartesians, and all other philosophers, against it. In this preface, Mr. Cotes has ably answered those, who contended, that gravity or attraction, in the system of Newton, was not a clearer principle, nor one more fit to explain the phænomena of nature, than the occult qualities of the peripatetics : for, there were still philosophers, such as they were, who persisted in that absurd opinion ! "Gravity," said the objectors, "is an occult cause; and occult causes have nothing to do with true philosophy." To which Mr. Cotes made this lucid reply:—"Occult causes are not those whose existence is most clearly demonstrated by observation and experiment; but those only whose existence is occult, fictitious, and supported by no proofs. Gravity, therefore, can never be called an occult cause of the planetary motions; since it has been demonstrated from the phænomena, that this quality really exists. Those rather have recourse to occult causes, who make vortices to govern the heavenly motions; vortices, composed of a matter entirely fictitious, and unknown to the senses. But, shall gravity therefore be called an occult cause, because the cause of gravity is occult, and as yet

* This extraordinary man, who was the first Plumian professor of astronomy and experimental philosophy at Cambridge, was born July 10, 1682, and died prematurely June 5, 1716.

year 1776. A writer under the signature of M. W. (and who is supposed to have been the late Rev.

undiscovered? Let those who affirm this, beware of laying down a principle which will serve to undermine the foundation of every system of philosophy that can be established. For causes always proceed, by an uninterrupted connexion, from those that are compound, to those that are more simple; and when you shall have arrived at the most simple, it will be impossible to proceed further. Of the most simple cause, therefore, no mechanical solution can be given; for if there could, it would not be the most simple. Will you then call these most simple causes *occult*, and banish them from philosophy? You may so; but you must banish at the same time the causes that are next to them, and those again that depend upon the causes next to them, till philosophy, at length, will be so thoroughly purged of causes, that there will not be one left whereon to build it."

The great doctrine of gravitation and attraction, the *substratum* of the Newtonian philosophy, is amply verified by numerous observations and experiments. Whether that which constitutes the principle of gravity be, in itself, an incorporeal or spiritual substance, or a *materia subtilis*, some very subtle kind of ethereal fluid, is a question which does not at all affect the actual existence of such a power. "We know," as is observed by a great astronomer* of our own time, "that all the bodies in our system are retained in their courses by such a power" (the power of attraction.) "And," he adds, "it is a very singular instance of the unerring wisdom of the CREATOR, that the law which this power observes is such, that notwithstanding the mutual attractions of the bodies, the system will never fall into ruin, but is capable of preserving itself to all eternity. "Moreover," continues the same profound writer, "the mutual attraction which takes place between distant bodies could not, of itself, either produce their motion about the sun, or the rotation about their axes: it required an external impulse to operate in conjunction with it, to produce these effects; an act, which nothing but the arm of OMNIPOTENCE could accomplish." "An invisible

* The Rev. Mr. Vince, A. M. F. R. S. Plumian Professor of Astronomy and Experimental Philosophy, in the University of Cambridge. See his *Complete System of Astronomy*, vol. ii. p. 291.

Matthew Wilson, a respectable presbyterian clergyman, of Lewes,⁽³⁷⁾ in the county of Sussex on Dela-

power pervades the whole system, and preserves it. In the effects produced by man, we see the operation of the cause; but "the ways of the ALMIGHTY are past finding out." "Hence," says our author, "in whatever point of view we take a survey of our system, we trace the Power, Wisdom, and Goodness of the CREATOR: his Power, in its formation; his Wisdom, in the simplicity of the means to produce the ends; and his Goodness, in making those ends subservient to our use and enjoyment. Thus we are led by our enquiries into the structure of the universe, to the proofs of the existence and attributes of a SUPREME BEING, who formed and directs the whole. Arguments of this kind produce conviction which no sophistry can confound. "Every man may see it; man may behold it afar off." Let not therefore the ignorant declaim against those pursuits which direct us to a knowledge of our CREATOR, and furnish us with unanswerable arguments against the infidel and the atheist."

But, to return more immediately to the doctrine of gravitation: Some experiments had been made by M. Boguer and M. de la Condamine, so long since as the year 1738, upon the Chimborazo in South-America, in order to test the Newtonian theory of gravity, by examining the attraction of mountains; and the result accorded with that theory. With a view, however, to establish the principle more completely, the experiments of Messrs. Boguer and Condamine having been made under so many disadvantages, as rendered the result not sufficiently accurate to be entirely depended on, similar experiments were made upon the mountain Schehallien in Scotland, by Dr. Maskelyne, at the request of the Royal Society, and under the patronage of his sovereign, the present king, who liberally undertook to defray the expenses. From observations of ten stars near the zenith, he found the difference of latitudes of the two stations on the opposite sides of the mountain to be $54^{\circ}, 6$; and by a measurement of triangles, he ascertained the distance of the parallels to be 4364,4 feet, corresponding, in that latitude, to an arc of the meridian of $42^{\circ}, 94$, which is $11^{\circ}, 6$ less than by observation: its half therefore, $5^{\circ}, 8$, is the effect of the attraction of the mountain; and from its magnitude, compared with the bulk of the whole earth,

ware,) published in *The Pennsylvania Magazine*, for March and April in that year, (conducted by the late Mr. Robert Aitken of Philadelphia,) some speculations, under the head of "A proposal for reducing Natural Philosophy to a System, with Remarks on the Cartesian and Newtonian Theories." In his lucubrations, this writer discovered a decided partiality for the doctrine of Descartes, in preference to those of Newton. Nor did this admirer of the justly exploded philosophy of the former long want a coadjutor: for, in the same Magazine, for the succeeding month, appeared another reverend gentleman of the same religious persuasion, and known to possess a copious fund of scholastic learning; who, under the signature of J. W. approved, in the main, of the opinions of his precursor, on this occasion. After acknowledging that the Newtonian system prevailed universally in Great-Britain, and pretty generally throughout the rest of Europe, he asks—"Shall we then hear any thing against the Newtonian principles, in Answer?" He adds—"I answer, yes." After rendering a constrained kind of compliment to the great Newton, for his "inexpressible service to Philosophy"—"so far as he adhered to his own plan,"—he proceeds with intro-

Dr. Maskelyne computed the mean density of the latter to be about double that of the mountain. "Thus," to use the words of Mr. Vince, "the doctrine of *Universal Gravitation* is firmly established." The reader will find Dr. Maskelyne's deductions from this experiment, in Vince's *Complete System of Astronomy*, vol. ii. p. 100 and seq.

(37) The essay signed M. W. is dated from that place.

ducing "A few Thoughts on Space, Dimension, and the Divisibility of Matter *in infinitum*."

Much as Mr. Rittenhouse was averse to controversy of any kind, he could not content himself without publicly pointing out one palpable fallacy, among the many mistakes which the last mentioned writer had fallen into: for he did not notice the preceding production of 'M. W.' not deeming it, probably, worthy of his attention. Accordingly, having been shewn 'J. W.'s' essay, with some remarks on it by his ingenious friend Mr. Ellicott (then quite a young man,) Mr. Rittenhouse drew up some observations, very concisely, on the errors of this Anti-Newtonian essayist: This piece will be found in the same periodical work, for June 1776. Being addressed to Mr. Aitken, the publisher of the Magazine, our Philosopher concludes his strictures thus: "I wish the gentleman would be more cautious, for the future; as well on your own account as for the sake of your readers, some of whom may be misled by the weakest reasoning, on a subject which they do not understand."⁽³⁸⁾ and I will venture

(38) In the beginning of these observations of Mr. Rittenhouse, on "J. W.'s" piece, he says—"I am one of those who are ready to subscribe to the general maxim, That perfection is not to be found in any thing human; and therefore do not suppose the Newtonian philosophy to be so perfect as not to admit of amendment: But I must confess, that almost all the attempts to controvert that philosophy, which I have met with, amount to nothing more than so many proofs, that those who made them did not understand it. Of this kind, are the objections started by your correspondent, J. W."

to assure him, that the whole doctrine of Infinites, which he is pleased to call a sophism, will not produce one contradiction in a mathematical head. Those of another cast⁽³⁹⁾ need not meddle with it, since there is a sufficient variety of literary subjects to engage every man, according to the bent of his genius."

A further proof of Mr. Rittenhouse's unremitting attachment to the interests of science, even "amidst the calamities of an unhappy war," will be found in the following circumstances; a written memorial of which, is preserved in the family of his friend, the late Dr. W. Smith.

On the 2d day of November, 1776, Mr. Rittenhouse was engaged, in the city of Philadelphia, jointly with Dr. Smith and Mr. John Lukens, in observing the transit of Mercury over the Sun, which appeared that day. On the 9th of January, following, the Doctor and Mr. Rittenhouse employed themselves at the same place, in like Observations on an eclipse of the Sun, which then occurred. And, on the 24th of June, 1778, just one week after the evacuation of that city by the British army, the three gentlemen here named, together with Mr. Owen Biddle, were busied in making observations, there, on another eclipse of the Sun. The results of these several Observations, in the

(39) Alluding, probably, to Metaphysicians; for, neither Mr. M. W. nor Dr. J. W. was distinguished as a Mathematician.

hand-writing of Dr. Smith, having been bound up by him with a copy of T. Mayer's Lunar Tables, the writer of these Memoirs was obligingly permitted by Mr. Charles Smith, the Doctor's son, to transcribe them, for publication in this work. A true copy of them is accordingly given in the Appendix.

But, to return to some political events of the year 1776: In the month of September of that year, Mr. Rittenhouse was one of twenty-four persons who were appointed justices of the peace, for the whole State of Pennsylvania; in their capacity of members of the then existing council of safety.

This appointment was made by virtue of an ordinance of the convention of Pennsylvania, which passed the first constitution of the state, on the 28th of September, 1776, of which he was also a member, for the city of Philadelphia. That convention could boast of possessing, among their members, two distinguished philosophers, Franklin⁽⁴⁰⁾ and Rittenhouse: but it cannot be ascertained, whether the opinions of these two eminent men, on the subject of government, had any decided influence on the deliberations of that assembly. Certain it is, however, that the Constitution framed and promulgated by the convention, was predicated on too many new and untried principles of civil polity; that it contained too many aberrations from maxims

(40) Dr. Franklin was president of that convention.

founded on a knowledge of human nature, to have warranted a reasonable expectation, that it could long prove practically beneficial. Hence, after an experiment of fourteen years continuance, it was succeeded by the present constitution of the state; one admirably well suited to secure the rights and liberties of its citizens, individually, and to promote the prosperity of the whole community, so long as it shall be faithfully and wisely administered.⁽⁴¹⁾

The thirteen British Colonies, which, on the memorable fourth day of July, 1776, had declared themselves free and independent States, assumed at the same time a national character, under the denomination of "The United States of America," in the articles of confederation and perpetual union between the states, then published:⁽⁴²⁾ and by these articles it was

(41) Dr. Ramsay, who published his History of the American Revolution at the close of the year 1789, after observing that the policy of Great-Britain, in throwing the inhabitants of her ancient colonies on the American continent out of her protection, induced a necessity of establishing independent constitutions for themselves, makes these judicious remarks:—"The many errors that were at first committed by unexperienced statesmen, have been a practical comment on the folly of unbalanced constitutions and injudicious laws."

(42) The articles of confederation were not finally ratified by congress until the 9th of July, 1778. "After eleven years experience," as Dr. Morse has observed, "being found inadequate to the purposes of a federal government," the present constitution of the United States was formed at Philadelphia, in the summer of 1787, by that wise, liberal and patriotic assembly, in which the illustrious Washington presided.

agreed, that each state should retain its sovereignty, freedom and independence, and every power, jurisdiction and right, not expressly delegated to congress by the confederation. As soon, therefore, as Pennsylvania had adopted her state-constitution, measures were pursued for organizing her government, in conformity to its provisions. The right of appointing the treasurer of the state by annual election, was vested in the immediate representatives of the people, when assembled in their legislative capacity. This policy had been invariably pursued in the proprietary government of Pennsylvania, while she continued to be a British province: after the abrogation of the first constitution of the state, the same mode of appointing that important officer, the state-treasurer, was continued, and will probably long remain a constitutional provision.

The person first appointed to that high trust, under the republican government of Pennsylvania, was David Rittenhouse: a man whose stern integrity, numerous public services, and uniform adherence to those principles which gave rise to the American revolution, were well calculated to inspire a general confidence in his character; more especially, in times when virtue and talents were considered as meritorious qualities in public men, by those who elevated them to office. The first legislative body of the State, after the declaration of independence, assembled at Philadelphia in October, 1776; and, on the 14th day of January, in the following year, they chose Mr.

Bittenhouse to be the state-treasurer, without a dissenting voice. In like manner, he was unanimously continued in that station, during twelve succeeding years ; in the last of which, he sent to the legislature his resignation of that office : this event shall be more particularly noticed in its proper place in the order of time.

In consequence of the possession of the city of Philadelphia by the British army, from the latter end of September, 1777, until the beginning of the ensuing summer, the session of the state-legislature which intervened, was held at Lancaster. The compulsory removal from the capital, not only of the government of Pennsylvania but of congress also, and all the offices attached to the seat of the national government, produced an high degree of agitation and resentment in the public mind ; more especially in Pennsylvania, where the evils occasioned by the occupancy of their capital by an hostile army, were more keenly felt by the citizens.

Under these impressions, the general assembly of that state passed a law on the 13th of October (only seventeen days after the British forces entered Philadelphia,) entitled "An act for constituting a council of safety, &c." By this act, twelve persons therein named, of whom David Bittenhouse was one, were constituted that council : and to this body, jointly with the supreme executive council of the state, great

and extraordinary powers were given, to punish (even capitally) offenders, "traitors or others, who from their general conduct, or conversation, should be deemed inimical to the common cause of liberty and the United States of North-America." The irritation, that could have provoked such a measure, must have been extreme! for, surely, nothing less than an extremity of necessity could be urged as any sort of justification, in a free country, of a legislative act, whereby the constitution was grossly violated, laws were dispensed with, and a summary authority of the highest nature, vested in a tribunal unknown to the laws and unwarranted by the constitution.⁽⁴³⁾ It is believed, however, that no proceedings were had un-

(43) "War never fails," as Dr. Ramsay has justly observed, "to injure the morals of the people engaged in it. The American war in particular," continues that historian, "had an unhappy influence of this kind. Being begun without funds or regular establishments, it could not be carried on without violating private rights; and in its progress, it involved a necessity for breaking solemn promises, and plighted public faith. The failure of national justice, which was in some degree unavoidable, increased the difficulties of performing private engagements, and weakened that sensibility to the obligations of public and private honour, which is a security for the punctual performance of contracts."

This is a melancholy but faithful representation of some of the injurious impressions made on the moral sentiments and feelings of the people of this country, by the revolutionary war: evils inseparable from warfare; and such as necessarily spring from a state of things, alike destructive of social order and the refinements of society, as repugnant to the precepts of religion, the dictates of natural justice and the mild suggestions of benevolence.

der this strange legislative act: and the writer is firmly persuaded, that neither Mr. Rittenhouse, nor some others of the gentlemen who constituted the tribunal erected by that act, would have undertaken to exercise some of the powers required of them, thereby.

During the occupancy of Philadelphia by the British forces under Sir William Howe, the commander in chief, from the 26th of September, 1777, until the evacuation of that city on the 18th of June, in the following year, Mr. Rittenhouse resided at Lancaster;⁽⁴⁴⁾ where he was busily employed in the duties of his office of treasurer of the state.⁽⁴⁵⁾ Before his removal

(44) This large and thriving borough, said to be the greatest inland town in the United States, was, for a short time, (though very short, indeed,) the seat, or rather place of refuge, of the American congress; the members of which, having separated on the near approach of the British army, eight days before their occupation of the capital, re-assembled at Lancaster the 27th day of the same month. Lancaster, which is situated at the distance of sixty-four miles from Philadelphia, in a direction nearly west, was at first conceived to be a place of safety: but, for their more perfect security, congress convened, three days afterwards, at York in Pennsylvania, a considerable county-town about twenty-two miles westward from Lancaster, and from each of which places, the intervening great river Susquehanna is about equidistant.

(45) His active mind derived much of its happiness from its continual employment. It appears, that, while engaged in the duties of his office, at Lancaster, in the latter part of the year 1777, he made the calculations for an Ephemeris, called "Father Abraham's Pocket-Almanack, for the year M.DCC LXXVIII;"

from Philadelphia, he had placed his family at or in the vicinity of his farm in Norriton, distant about twenty miles in a north-westwardly direction from the capital; then conceiving that situation to be a place of safety from any hostile excursions. While he himself continued in the borough of Lancaster, he made his home at the house of the late William Henry, Esq. at that time treasurer of the rich and populous county of the same name; a situation which was very commodious for the business of his office, from its connexion

the late Mr. John Dunlap, the publisher, (who was, during many years, an eminent printer in Philadelphia,) having, in his advertisement of it, announced to the public, that "The Astronomical Calculations of this Almanack were composed by David Rittenhouse, A. M." Mr. A. Ellicott made calculations for Pennsylvania and Maryland Almanacks, several years after Mr. Rittenhouse declined to continue them.

It is believed that our Astronomer made the calculations for "Father Abraham's Almanack," and probably some others, for several years: but mostly in the earlier part of his life. And, as it was no disparagement to the talents of a Franklin to publish "Poor Richard's Almanack,"* (which the Doctor long continued to print,) so it was none to the genius and abilities of a Rittenhouse, that he employed himself, occasionally, in making calculations of an useful nature for these Ephemerides.

* Not only the astronomical calculations of this once well-known and highly esteemed Ephemeris, but its poetry also, (which is said to have possessed a considerable share of merit,) were the productions of Jacob Taylor, Esq. an old English gentleman, who, for some time, executed the office of Surveyor-General of Pennsylvania. Franklin was the printer and publisher of this Ephemeris: but many of the productions of his pen, which appeared in it, and, among the rest, his "Way to Wealth," contributed towards rendering it a very popular publication, of its kind. Franklin commenced the publication of "Poor Richard's Almanack," in the year 1732, when he was but twenty-six years of age.

with that of the county-treasurer, and one which was also rendered the more agreeable, by reason of Mr. Henry being a person of very considerable mechanical ingenuity.

This separation of Mr. Rittenhouse from his wife and children—attended too, as it was, by the most embarrassing circumstances, and great uncertainty with respect to the extent of its continuance—produced, in such a disposition as his, the most poignant feelings. His lot, it is true, was that of thousands of his fellow-citizens: nor were the opposite party exempt from similar evils; many of whom were obliged to abandon their homes, and, after making great sacrifices, to seek an asylum among strangers. These were a part of the miseries inseparable from a state of war; and some of them were of that nature which necessarily resulted from a war of so singular a character; considerations, however, which could not afford much alleviation to the anxious feelings of our Philosopher, in his exile: those sensations were in his mind, extremely acute; aggravated as they were, by the almost hopeless condition of his native country at that time.⁽⁴⁶⁾

(46) "At no period of the war," says chief-justice Marshall the historian, "had the American army been reduced to a situation of greater peril, than during the winter at Valley-Forge," "More than once they were absolutely without food. Even while their condition was less desperate in this respect, their stock of provisions was so scanty, that there was seldom at any time in the stores a quantity sufficient for the use of the troops for one week. Consequently, had the enemy moved out in force,

A letter which he wrote to his wife, from Lancaster, on the 26th of January, 1778, strongly bespeaks his inquietude and distress, at that alarming period; and is, besides, so very expressive of his purity of heart and the delicacy of his conjugal and parental affections, that the following extracts from it will, it is presumed, be strikingly indicative of his principles and temper.

“One of your last,” says Mr. Rittenhouse to his wife, “convinces me, that the fears I expressed in a former letter are well-founded; I mean, that you will write, when writing is painful to you: Indeed, my dear H. I am not so unreasonable as to desire it.”—“Your letters, my dearest H. give me mingled pleasure and pain. There is nothing in this world I value

the American army could not have continued in camp. The want of provisions would have forced them out of it; and their deplorable condition with respect to clothes, disabled them from keeping the field in the winter. The returns of the first of February (1778) exhibit the astonishing number of three thousand nine hundred and eighty-nine men in camp unfit for duty, for want of clothes. Of this number, scarcely a man had a pair of shoes. Even among those returned capable of doing duty, very many were so badly clad, that exposure to the colds of the season must have destroyed them. Although the total of the army exceeded seventeen thousand men, the present effective rank and file amounted to only five thousand and twelve. The returns throughout the winter do not essentially vary from that which has just been particularly stated.”

Such was the miserable condition of the American army, at the date of the above returns! It was, indeed, sufficiently desperate in appearance, to have appalled the stoutest heart; and it required the magnanimity, as well as the virtue of a WASHINGTON, to conquer such difficulties and rise superior to them.

so much, as your esteem and affection : Your very kind expressions of regard, and concern for my health, would therefore make me happy, if it were not for our unfortunate situation. But we have long since talked of the necessity of reconciling ourselves to the prospect of a separation,—perhaps for years : this, I fear, you have still made little progress in doing, if I may judge from your letters. Nevertheless, the dismal prospect still continues. I cannot, indeed, boast of much more resolution myself. If providence has espoused the cause of our enemies, for wise reasons unknown to us,—Heaven, nevertheless, is my witness, with what integrity I have acted ; and, that the virtue and happiness of my fellow-creatures has always been my principal object. I am, therefore, not at all distressed on my own account, confident of being happy, in whatever part of the world my lot may be thrown : but how to leave you exposed to the frowns of fortune ; to leave you to the mercy of an unfeeling world, rendered more callous by general distress ; to leave you thus, confiding only in the goodness of Providence, is what I have still to learn. May kind Heaven render it unnecessary !

“ I shall perhaps, before I seal this, appoint a time to meet you. In my last, I partly promised to come and stay a fortnight with you : but I do not now think it so safe, as I did then. In our present situation, I should not think it prudent to stay above one night with you, as parties of horse are employed to pick up

particular persons. For this reason, I would rather meet you at one of your brothers,' or at sister's;⁽⁴⁷⁾ but I apprehend the Schuylkill is, at present, difficult—if not dangerous—to cross, on account of the ice.

“Tuesday morning.—I am now nearly determined to appoint next Saturday week, in the evening, to meet you at brother John's;⁽⁴⁸⁾ and yet I fear it may expose one or both of us to a very uncomfortable ride. I will, however, be there, if the weather be tolerable and health permit; but do not come, my dear H. if the weather should be bad; because if I do not find you there, I shall proceed to brother Israel's,⁽⁴⁹⁾ where I shall be glad to find you on Sunday, in order to accompany you home. If you can find any opportunity to write before then, I shall be glad to receive a line.”

After experiencing the numerous and distressing privations incident to a nine months banishment from his home and separation from his family—during a period, too, of great calamity and suffering among his countrymen, Mr. Rittenhouse most joyfully returned to

(47) This sister of Mrs. Rittenhouse was the widow of Colonel Caleb Parry, a gallant officer in the American service, who was killed at the battle of Long-Island in July, 1776.

(48) John Jacobs, Esq.—This gentleman was a brother of Mrs. Rittenhouse.

(49) Israel Jacobs, Esq.—Another brother of Mrs. Rittenhouse.

Philadelphia, soon after its abandonment by the hostile army ; and there, once more, enjoyed the solace of a reunion with his wife and children ; amidst whose tender embraces, and the mutual congratulations of his friends and fellow-citizens, especially of the returning exiles, he participated largely in those delightful sensations with which such an occasion, and such scenes, must have inspired a virtuous heart.

In Philadelphia, Mr. Rittenhouse resumed the discharge of his official functions, as treasurer of the state ; an office, in the execution of which there were very numerous and complicated duties, arising out of the novel system of finance and paper-credit, pursued by both the general and state governments during the war : consequently, his attention to this business engrossed so much of his time, as to leave him little leisure for pursuits more congenial to his mind.

In a very short time after Mr. Rittenhouse's return to Philadelphia he received a letter from Mr. Jefferson, congratulating him on that happy event : and expressing, in very forcible terms, the exalted sense that gentleman entertained of our Philosopher's genius, talents, and usefulness. It indicates, also, the solicitude felt by its writer, lest the Orrery of Mr. Rittenhouse's invention and construction, belonging to the College of Philadelphia, had been either removed or injured by the British forces, while they occupied that city. On this head, however, the apprehensions conceived

by Mr. Jefferson proved to be groundless : for, not only was the Orrery not removed from its proper station ; but, at the instance of the Rev. Dr. Smith, the provost of the College, the apartment in the College edifice which contained the invaluable machine, was closed up by order of Sir William Howe, to prevent its being injured ; and no person was permitted to enter that apartment to view the Orrery, without the Provost's consent ; on which occasions he uniformly attended in person, with the keys kept in his possession. The means thus used, to secure from any injury property so inestimable to the friends of science, is a circumstance that certainly reflects much honour upon the parties by whom they were effected,—even though one of them was, at that time, necessarily viewed in the character of an “ enemy.”

But, in order that the reader may be enabled to form his own judgment, on Mr. Jefferson's estimate of genius, and concerning the rank and privileges to which the distinguished writer conceives men of great philosophical talents are entitled, the letter, just referred to, is now presented to him : it is as follows.

“ Monticello in Albemarle, Virginia, July 19, 1778.

“ Dear sir,

“ I sincerely congratulate you on the recovery of Philadelphia, and wish it may be found uninjured by the enemy. How far the interests of literature may have suffered by the injury or removal of the Orrery

(as it is miscalled), the public libraries, and your papers and implements, are doubts which still excite anxiety. We were much disappointed in Virginia generally, on the day of the great eclipse,⁽⁵⁰⁾ which proved to be cloudy in Williamsburg, where it was total. I understand, only the beginning was seen at this place, which is in Latitude $38^{\circ} 8'$ and Longitude West from Williamsburg, about $1^{\circ} 45'$ as is conjectured; eleven digits only were supposed to be covered. It was not seen at all till the moon had advanced nearly one-third over the sun's disc. Afterwards, it was seen at intervals through the whole. The egress particularly was visible. It proved, however, of little use to me, for want of a time-piece that could be depended on; which circumstance together with the subsequent restoration of Philadelphia to you, has induced me to trouble you with this letter, to remind you of your kind promise of making me an accurate clock, which being intended for astronomical purposes only, I would have divested of all apparatus for striking, or for any other purpose, which by increasing its complication might disturb its accuracy. A companion to it, for keeping seconds, and which might be moved easily, would greatly add to its value. The

(50) This eclipse, which happened on the 24th day of June, 1778, was observed in Philadelphia, by Dr. Rittenhouse, the Rev. Dr. W. Smith, John Lukens, Esq. and Mr. Owen Biddle, at the College in that city. The result of the joint observations made by those gentlemen on that occasion, as drawn up by Dr. Smith, but never before published, will be found in the Appendix. W. B.

theodolite, for which I spoke to you also, I can now dispense with, having since purchased a most excellent one.

“Writing to a Philosopher, I may hope to be pardoned for intruding some thoughts of my own, though they relate to him personally. Your time for two years past has, I believe, been principally employed in the civil government of your country. Though I have been aware of the authority our cause would acquire with the world from its being known that Yourself and Doctor Franklin were zealous friends to it, and am myself duly impressed with a sense of the arduousness of government, and the obligation those are under who are able to conduct it; yet I am also satisfied there is an order of geniuses above that obligation, and therefore exempted from it. Nobody can conceive that nature ever intended to throw away a Newton upon the occupations of a crown. It would have been a prodigality for which even the conduct of Providence might have been arraigned, had he been by birth annexed to what was so far below him. Co-operating with nature in her ordinary economy, we should dispose of and employ the geniuses of men according to their several orders and degrees. I doubt not there are in your country many persons equal to the task of conducting government: but you should consider that the world has but one Rittenhouse, and that it never had one before. The amazing mechanical representation of the solar system

which you conceived and executed, has never been surpassed by any but the work of which it is a copy. Are those powers then, which, being intended for the erudition of the world, are, like air and light, the world's common property, to be taken from their proper pursuit to do the common-place drudgery of governing a single state, a work which may be executed by men of an ordinary stature, such as are always and every where to be found? Without having ascended Mount Sinai for inspiration, I can pronounce that the precept, in the decalogue of the vulgar, that they shall not make to themselves the 'likeness of any thing that is in the heavens above,' is reversed for you, and that you will fulfil the highest purposes of your creation by employing yourself in the perpetual breach of that inhibition. For my own country in particular, you must remember something like a promise that it should be adorned with one of them. The taking of your city by the enemy has hitherto prevented the proposition from being made and approved by our legislature. The zeal of a true whig in science must excuse the hazarding these free thoughts, which flow from a desire of promoting the diffusion of knowledge and of your fame, and of one who can assure you truly that he is with much sincerity and esteem your most obedient and most humble servant.

TH. JEFFERSON.

“P. S. If you can spare as much time as to give me notice of the receipt of this, and what hope I may form of my Clock, it will oblige me. If sent to Fredericksburg, it will come safe to hand.”

In the commencement of the year 1779, our benevolent Philosopher had an opportunity of testifying the friendly interest he took in the prosperity of his brother-in-law the Rev. Mr. Barton, and his family. This gentleman was then, with Mrs. Barton,⁽⁵¹⁾ in the city of New-York; to which they went towards the close of the year 1778, in pursuance of a permission granted for that purpose by the government of Pennsylvania, under certain conditions. All Mr. Barton's children excepting the eldest, (the writer of these Memoirs), who was then abroad, remained in Pennsylvania; those in their minority, being six of the seven so remaining, having been previously placed under the charge of suitable persons. After a long absence of the eldest son from his native country, he returned to Pennsylvania the beginning of the year 1779. Immediately after his arrival at Lancaster, he received a letter from Mr. Rittenhouse, dated in Philadelphia, January 24th 1779, in which he says—“I most sincerely congratulate you on your safe arrival, and im-

(51) To this lady, who is yet living, Mr. Barton was married in the year 1776. She remains his widow, and enjoys the very affectionate respect of Mr. Barton's descendants and relatives, to which her great worth and many virtues justly entitle her.

patiently expect the pleasure of seeing you here. I received yours from Baltimore, ten days after the date, and immediately wrote to your father,⁽⁵³⁾ sup-

(53) Colonel Samuel J. Atlee, formerly a parishioner of the Rev. Mr. Barton, had written two letters to him, to inform him of his son's arrival. The second of these only had got to hand, and was acknowledged at the same time as Mr. Rittenhouse's. Col. Atlee, who was a steady friend of Mr. Barton's family, was a valuable officer in the American army, in the earlier period of the war; and afterwards served as a delegate in congress, for the state of Pennsylvania.

The difficulty of Mr. Barton's returning to Pennsylvania, and which he alludes to, in his letter to Mr. Rittenhouse, arose from the terms of his passport to New-York, from the Supreme Executive Council of Pennsylvania: it permits him to go to New-York, "not to return." A letter which Mr. Barton wrote to John De Hart, Esq. of Elizabeth-Town in New-Jersey, on the 30th of January, 1779, will sufficiently explain the conscientious scruples which actuated the writer's conduct; and they were such as, it is presumed, will have weight, when dispassionately and liberally considered.

In addressing Mr. De Hart, Mr. Barton says:—"I received your favour of the 22d instant, by Mr. Alexander. The papers with which you entrusted me, gave me no trouble, except that of my not being able to serve you in the manner which was first proposed. You may depend on their safety in my hands; subject to such directions as you shall be pleased to give me." "I wish for an opportunity to oblige you, and if any should offer, I beg you will employ me without any apology.

"I am just informed that my son has returned to his native country, after an absence of between three and four years. How melancholy and distressing is my situation! separated from eight children, and three congregations, to whom I am bound by duty, gratitude, and every tie of affection! 'A parent only knows a parent's woes;' and such will feel for me. You are kind enough to tell me, that my son requests me to return to my parish. What he can mean by this request, I am totally at a loss to understand:

posing him to be still at New-York;⁽⁵³⁾ though we cannot be certain as to that matter." The Rev. Mr. Barton, on the 15th of February, acknowledged the

could the matter have been determined by my option, I should never have left my parish, for any prospect or preferment that could offer. But no choice was left me, but either to take the oath, or to suffer a painful separation from my dearest connexions; as well as from a country which always had, since I have known it, my predilection and best wishes; a country to which, I can declare (with an appeal to heaven for the truth of the declaration,) I never did, or wished to do, 'any act or thing prejudicial or injurious:' and though my heart assures me, that many conscientious and good men have conformed to the test-act, yet my own conscience always revolted at the abjuration part of it, and prevailed with me to surrender every worldly consideration, that should come in competition, or tempt me to a violation of it. This, sir, was the only crime (if a crime it be) for which I now suffer banishment from all that are most dear to me; with an interdict, "not to return again." I cannot therefore comprehend, how I can consistently return, before this interdict is cancelled; or some assurance given me, that I may again unite and live quietly with my family, without being subject to an abjuration, which I cannot take. The proper duties and profession of a minister of the gospel should, in my opinion, never lead him into the field of politics. In conformity to this opinion, every man who knows me can testify, that I never degraded my function by intermeddling, directly or indirectly, in the present unhappy contest: so that my own scruples would be a stricter tie upon me, than any that could be made by oaths or tests. You will excuse my troubling you on this subject, when I tell you, that the kind manner in which you address me has drawn it upon you."

(53) It was Mr. Barton's intention, when he left Pennsylvania, to embark at New-York for England or Ireland: but his ill state of health, which soon after ensued, prevented his leaving New-York.

receipt of his brother-in-law's letter to him, which, although dated the 16th of January, did not reach him until the 18th of the succeeding month. In this answer, Mr. Barton says ;—"To see, and to be united with my children, is my most earnest wish ; but how that happy event is to be obtained, I know not: If my son should choose to come to Elizabeth-Town, perhaps I might be indulged with a flag, to have an interview with him there."⁽⁵⁴⁾

In the autumn of the same year, Mr. Rittenhouse again manifested his friendly attachment to Mr. Barton's family, on an occasion which offered, relating to the writer of these Memoirs personally. Soon after the appointment of the late Henry Laurens, Esq. to be envoy to Holland, Mr. Rittenhouse applied to that gentleman for the purpose of obtaining for the writer, who was well known to him, the secretaryship to that mission: but Mr. Laurens had determined to appoint no secretary; at least before he should arrive in Holland. In a letter to the writer of this, communicating the result of his application, Mr. Rittenhouse says—"I wish you could obtain some handsome thing of this

(54) This indulgence was obtained in April, 1780, from the Supreme Executive Council of Pennsylvania, chiefly through the friendship of the late general Joseph Reed, then president of that body; and, in pursuance of this passport, sanctioned by general Washington, the desired interview was had with Mr. and Mrs. Barton, at Elizabeth-Town, a very short time before the death of Mr. Barton.

kind; but there are such numbers of humble suitors to, and dependants on, members of congress, that every thing is snapped up, before you or I know any thing of the matter."

In consequence of a territorial dispute which had arisen between Pennsylvania and Virginia, Mr. Rittenhouse was appointed by the legislature of the former, in the year 1779, one of the commissioners for settling that controversy: his colleagues, on that occasion, were George Bryan, Esq. and the reverend Dr. Ewing.

These commissioners, thus nominated on behalf of their own state, were authorised "to meet and agree with other commissioners, on the part of Virginia, upon the western boundary." They accordingly met Dr. James Madison, president of the college of William and Mary, (late bishop of the protestant episcopal church in Virginia), and Robert Andrews, professor of mathematics in that institution, the commissioners appointed by Virginia,—for the purposes of their respective appointments. This meeting was held on the 31st day of August, 1779. The propositions for an amicable adjustment of the boundary line in dispute, were first made by Pennsylvania: and, at the meeting thus held, in consequence of Virginia having acceded to those propositions, the joint commissioners of the two states entered into the following agreement:

“ We, George Bryan, John Ewing, and David Rittenhouse, commissioners from the state of Pennsylvania, and we, James Madison and Robert Andrews, commissioners for the state of Virginia, do hereby mutually, in behalf of our respective states, ratify and confirm the following agreement, viz. To extend Mason’s and Dixon’s line, due west, five degrees of longitude, to be computed from the river Delaware, for the southern boundary of Pennsylvania, and that a meridian, drawn from the western extremity thereof to the northern limit of the said state, be the western boundary of Pennsylvania for ever.”

This agreement, signed by the respective commissioners of the contending states, was, on the 19th of November ensuing, unanimously ratified and confirmed by the General Assembly of Pennsylvania, and its ratification duly transmitted to the government of Virginia.

But this agreement, thus solemnly concluded, did not quiet the pre-existing disputes. Divers persons, deriving authority, or pretending so to do, under the government of Virginia, proceeded to Fort Byrd in the county of Westmoreland, thirty miles at least within the line agreed on by the commissioners,—and upon lands originally settled under Pennsylvania, and long held as being within its unquestionable jurisdiction; and these intruders there exercised a summary and arbitrary authority, tending to the dispossession

of the grantees under Pennsylvania; vexing and disturbing them, greatly, in the peaceable possession of lands which they had honestly purchased, and cultivated for a long course of years. Such injustice and outrages, on the part of the Virginia intruders, induced congress to interpose the little authority they possessed, for the purpose of tranquillizing the contending parties, at a period when the harmony of the citizens of the several states was highly important to the safety of the whole confederacy. Accordingly, in December, 1779, and nearly four months after the adjustment of the before disputed boundary by the persons duly empowered to settle the same, congress passed a resolution, attested by their secretary, in these words:

“ In Congress, December 27, 1779.

“ Whereas it appears to congress, from the representation of the delegates of the state of Pennsylvania, that disputes have arisen between the states of Pennsylvania and Virginia, relative to the extent of their boundaries, which may probably be productive of serious evils to both states, and tend to lessen their exertions in the common defence : Therefore,

“ Resolved, That it be recommended to the contending parties, not to grant any part of the disputed land, or to disturb the possession of any persons living thereon; and to avoid every appearance of force, until the dispute can be amicably settled by both states, or

brought to a just decision by the intervention of congress; that possessions forcibly taken be restored to the original possessors, and things be placed in the situation in which they were at the commencement of the present war, without prejudice to the claims of either party."

It is evident from the face of this resolution, that congress were not disposed to notice this controversy, otherwise, than with extreme delicacy: and so cautious were they, under all existing circumstances, of interfering with the merits of this dispute between two great and powerful states, that they speak of the controversy as one then actually in existence, between those states; although, in regard to their respective governments, it had been settled long before. However, the day after the date of the resolution of Congress, the president and the supreme executive council of Pennsylvania issued a proclamation, requiring all officers, civil and military, and others, subjects of the state, to pay due obedience and respect to that resolution; and also encouraging the several grantees claiming under Pennsylvania to continue in the cultivation and improvement of their several estates and possessions, as well as in their allegiance and fidelity to the state,—notwithstanding any claims or pretences set up by the state of Virginia, or any other foreign jurisdiction; and assuring them of the protection and support of their own state, while so continuing in duty and obedience to its laws and government.

Notwithstanding all these proceedings, this extraordinary controversy was not terminated until long afterwards. In consequence of a resolution of the general assembly of Pennsylvania, of the 28th of August, 1783, the supreme executive council of that state passed, on the 11th day of the succeeding month, a resolution on their part, stating,—that, as many of the objections which had hitherto prevented the determination of the boundary-line, in question, were then removed, it became necessary to close that business with all possible accuracy and dispatch; and that, to this end, four commissioners should be immediately appointed, with directions to provide the necessary astronomical apparatus, and to correspond with those appointed by the state of Virginia for the same purpose: they therefore appointed the Rev. John Ewing, D. D., David Rittenhouse, Esq. treasurer of the state and Thomas Hutchins, Esq. to perform that duty.

The arduous service thus assigned to these gentlemen, all of them possessing great abilities, was accordingly executed; and a law was thereupon passed by the legislature of Pennsylvania, on the 1st of April, 1784; which, after reciting that the boundary-line agreed on by the former commissioners, on the 31st of August, 1779,—and which is therein stated to have been unanimously confirmed by Pennsylvania on the 23d of September, 1780, with the condition attached

thereto by Virginia,⁽⁵⁵⁾—was by this law finally confirmed.

Mr. Rittenhouse bore so conspicuous a part, in negotiating and executing this long-depending and important business, that the writer of his life could not deem it improper to introduce into it, this historical detail of a transaction of so much moment, which originated in 1779 and was not completed until 1784; and, more particularly, as (to use the words of Dr. Rush,) “to his talents, moderation and firmness, were ascribed, in a great degree, the satisfactory termination of that once alarming controversy.”

The death of the Rev. Mr. Barton, which occurred in the spring of 1780,⁽⁵⁶⁾ put a period to the sin-

(55) The conditions proposed by the state of Virginia (and which Pennsylvania considered as having a tendency to countenance unwarrantable claims that might be made under the state of Virginia, in consequence of pretended purchases or settlements, pending the controversy,) were these; viz :—That the line, commonly called Mason and Dixon’s line, be extended due west, 5° of long. to be computed from the river Delaware, for the southern boundary of Pennsylvania, and that a meridian, drawn from the western extremity thereof, to the northern limits of the said states, respectively, be the western boundary of Pennsylvania, for ever: on condition, that the private property and rights of all persons, acquired under, founded on, or recognized by the laws of either country, previous to the 31st of August, 1779, should be saved and confirmed to them, although they should be found to fall within the other; and that in the decision of disputes thereon &c. (see act of 1st April, 1784.)

(56) He died at New-York, the 25th of May, 1780, aged only fifty years; and was interred in the chancel of St. George’s Chapel, in that city.

care and intimate friendship between that gentleman and Mr. Rittenhouse, which had subsisted almost thirty years. This friendship, which may be said to have commenced almost in the youth of both parties, continued without interruption until the year 1776; when the declaration of American independence produced, unhappily, some abatement of it on each side; at least, so far as related to that great political measure, respecting which they entertained different opinions: For, although Mr. Barton was, in truth, warmly attached to the principles of the English whigs; and had, on various occasions, manifested his zeal for the liberties of the American people and rights of the colonists;⁽⁵⁷⁾ his opinions were conscientiously

(57) As Mr. Barton's deportment and services, very early in life, evinced his devotion to the happiness of his adopted country, the writer hopes he may be permitted, without being chargeable with great impropriety, to adduce the following evidences, among many which might be exhibited, of the usefulness and public spirit of a person, who was, during a long course of years, intimately connected with, and a confidential friend of David Rittenhouse.

Annexed to a printed copy of "A letter, concerning the office and duty of Protestant ministers, especially in times of public danger, written to a clergyman on the frontiers of Pennsylvania, on general Braddock's defeat,"* there is the following note:

"The gentleman to whom this was addressed,† as well as some ministers of other denominations, did, a few months after this, find it necessary to appear at the head of their people, and

* This letter is contained in a volume of Dr. Smith's Sermons, &c. published in England in two editions, in the years 1759 and 1762; and is also comprehended in an elegant edition of the Doctor's works, republished in Philadelphia a few years since.

† The Rev. Mr. Barton.

opposed, and only these, to the expediency of that measure. Yet it is believed, that the personal friend-

were signally instrumental in preventing some of the frontier counties from being totally abandoned by their inhabitants." See the Appendix to "Discourses on public occasions in America : By William Smith, D. D. Provost," &c. who was the writer of the letter. It is dated, "Philadelphia, August 21, 1755."

Extract of a letter, dated London, January 10th, 1759, from the Hon. Thomas Penn, Esq. to the Rev. Thomas Barton :—

"Since I received your last letter, I paid a visit to the present Archbishop,* and mentioned to him what you wished me to do. I found he did not approve of your contemplated removal; but he proposed, that twenty pounds sterling per annum should be added to your salary: for, his grace observed, that a person so capable as you are, to advise and assist the people in your neighbourhood,† could not be spared for any other mission: And, on that consideration, the society‡ had agreed to this augmentation of your salary."

On the 17th of June, 1767, Mr. Penn again wrote to Mr. Barton, from London; as follows:

"I am much concerned to find, that the missionaries have suffered so much, and that you are so uneasy in your situation as to have asked leave to move into Maryland. The society has offered, or intend to offer, an addition to your salary, or some other encouragement, if you stay in Pennsylvania: and I have desired Mr. Hamilton,§ who is upon his return, to talk to you

* Dr. Thomas Secker, then lately translated from the diocese of Oxford to the archi-episcopal see of Canterbury: "a name," as the author of the *Pursuits of Literature* has justly observed, "never to be uttered but with reverence, as the great exemplar of metropolitan strictness, erudition, and dignity." This excellent prelate, after most worthily sustaining the highest station in the English church more than ten years, died in the year 1768.

† Mr. Barton's residence was, at that time, in Redding township, York county, then a frontier settlement of Pennsylvania.

‡ The Society for the propagation of the Gospel in foreign parts.

§ James Hamilton, Esquire.—This gentleman was lieutenant-governor of Pennsylvania from the year 1748 to 1754—again, from 1759 to 1763—and president of the proprietary and governor's council, from the 6th of May.

ship of these intimate relatives was far from having ever subsided : the ties that early united them, were of the strongest kind ; that union was of long continuance ; and they were mutually sensible of each other's worth and talents.

The name of the Rev. Mr. Barton, which has hitherto been so often introduced in the course of these Memoirs, is closely connected with that of Mr. Rittenhouse, in many of the more striking traits of his Life : the writer cannot, therefore, restrain himself from acknowledging, that he is happy in having this fair opportunity of rendering some small tribute of respect—and, for himself, of filial veneration—to the memory of a man distinguished by his virtue, his talents, and his learning ; one, who, independently of those considerations, alone, which arose out of the American revolution, long enjoyed the friendship and esteem of many of the most prominent characters in America, by reason of his abilities and usefulness, as well as the urbanity of his manners. To have said

on this affair, before you take your resolution ; as I hope and intend to make you a present from me,* if you do not put that design into execution."

1771, to the 16th of October in the same year. He was a liberal patron of learning and science.

"Est et Hamiltonus nomen venerabile, cujus
Intemerata fides."——J. Beveridge, A.M.

* Mr. Penn actually gave to Mr. Barton, not long afterwards, the use of a valuable farm, on which were three tenants, situated in the neighbourhood of Lancaster. This farm, which was part of one of the proprietary-manors, Mr. Barton held during his life.

less of this person, would be doing injustice to the life and character of Mr. Rittenhouse : to say more, would perhaps be deemed irrelevant to the subject; if not indecorous, as it regards the writer.

To return, however, more particularly to Mr. Rittenhouse. On the 10th day of March, 1780, he was elected, by the general assembly of Pennsylvania, a trustee of the loan-office of the state.

The institution here mentioned was a measure of financial policy, which had its origin in Pennsylvania, at an early period of the provincial government : and, from an experience of its beneficial effects, it was not only continued, at various intervals of time, from the year 1723, to the termination of that government; but was resorted to, and for some time continued, by the state legislatures after the revolution. The scarcity of gold and silver, among the earlier settlers of the province, subjected them to many and great inconveniences, and suggested to the legislature the necessity of adopting some rational and efficient means of remedying the evil. The expedient was, the emitting, and making current, bills of credit; which were loaned to cultivators of the soil on the security of their lands, and repayable with interest, in annual payments, within an assigned term of years. The first act of assembly for this purpose was passed the 11th of May, 1723; and the preamble to that law is expressive of its object : it states, that, "Forasmuch

as through the scarcity of money, the trade of this province is greatly lessened and obstructed, and the payment of the public debts of this government rendered exceeding difficult, and likely so to continue, unless some medium in commerce be by law made current, instead of money : for remedy whereof, may it please the governor that it be enacted, and be it enacted by Sir William Keith, baronet, Governor, &c.” This act then goes on to direct the emission of “fifteen thousand pounds, current money of America, according to an act of Parliament made in the sixth year of Queen Anne, for ascertaining the rates of foreign coins in the Plantations;” and provides for the loaning of these bills, by persons thereby appointed “trustees of the general loan-office ;” to be loaned out, upon the security of mortgages of real estates, within the province, of at least three times the value of the sums lent: which sums so loaned were made repayable in those bills, in eight years, in annual payments of one-eighth part of the amount of the principal with the addition of an interest of five per cent. per annum. The act also contains a provision (but one which was omitted in the subsequent loan-office laws,) for lending these bills upon the security of plate also, for the term of one year. This paper-money, thus established upon indubitable funds,⁽⁵⁸⁾

(58) While the credit of the loan-office bills of credit, emitted in moderate sums by the assembly of Pennsylvania, was fully supported, during the course of seventy years, the quantities of paper-money issued at different times, by the legislative body of

was made a legal tender in the payment of debts;— and it never suffered any depreciation of its nominal value.⁽⁵⁹⁾

Hence, an interesting fact is presented to the view of the reader; that, ninety years ago, so small was

Massachusetts, down to the year 1748, had then depreciated that currency, for want of it being bottomed on sufficient funds, to one-eleventh part of its nominal value. Fortunately, about that period, a large sum in specie arrived from England, having been granted by the British parliament to reimburse the monies expended by the colonists in the expeditions against Louisburg and Canada. In Massachusetts, this money was wisely applied by its legislature to the redemption of the bills of credit of that colony, then in circulation; which were sunk, in the succeeding year, at the rate of fifty shillings, in those bills, for one ounce of silver. Thus, the mint-price of an ounce of sterling silver being five shillings and two pence, the bills were redeemed at the rate of nearly nine shillings and eight pence, of their nominal value, for one shilling in English coin.

(59) How different, in this respect, from that species of paper-credit, which, during the American war, succeeded it, under the denomination of *continental money*! But this had nothing but the faith of government pledged for its redemption; while the loan-office bills of credit were bottomed (as all government-paper ought ever to be) on an appropriated, sufficient, and substantial fund. For want of such a foundation, Dr. Morse remarks, that “The whole history of the continental paper is a history of public and private frauds. Old specie debts,” says he, “were often paid in a depreciated currency; and even new contracts, for a few weeks or days, were often discharged with a small part of their value. From this plenty, and the fluctuating state of the medium, sprung hosts of speculators and itinerant traders, who left their honest occupations for the purpose of immense gains in a fraudulent business, that depended on no fixed principles, and the profits of which could be reduced to no certain calculations.” See his Geographical work.

the population, and so slender were the agricultural and commercial resources of Pennsylvania, that the scanty amount of a sum equivalent to forty thousand dollars, was deemed adequate to the relief of the public and private difficulties in the province, arising from the want of a sufficient circulating medium at that time. Yet such was the increase of population and trade, and such were the improvements in agriculture, in Pennsylvania, in half a century afterwards, that the last loan-office law, under the provincial government,⁽⁶⁰⁾ directed the emission of ten times the original sum; to be applied, in aid of land-improvements, in loans for the term of sixteen years; and repayable in like manner, with an annual interest of six per centum.

The same policy was pursued by the independent government of Pennsylvania. Under the first loan-office law of that state,⁽⁶¹⁾ the sum of fifty thousand pounds was issued in bills of credit; and eight years afterwards, a further sum of half a million of dollars (or 187,500*l.*) was appropriated for the purposes of a loan-office on similar principles, in pursuance of a law of the state.⁽⁶²⁾ But, as the individual state-governments were prohibited by the constitution of the United

(60) Passed 26th February, 1773.

(61) Passed 4th April, 1785.

(62) Passed 11th April, 1793.

States, then recently established, from emitting bills of credit, or making any thing but gold and silver coin a tender in payment of debts,—the money to be employed in loans, on mortgages of real estates, was to be borrowed, according to the provisions of the law last mentioned, from the bank of Pennsylvania; a power which the state had reserved, for that express purpose, in the act to incorporate the subscribers to that bank. ⁽⁶³⁾

This loan-office law was, however, the last in Pennsylvania.⁽⁶⁴⁾ The establishment of banks, for facilitating the purposes of trade, together with the great improvements and wealth to which the landed interest of the state had attained, by means of a widely extended foreign commerce, coming in aid of the benefits which the cultivators had previously derived from the loan-office system, superseded, in a great degree, the utility of this institution. In one year after the last loan-office was erected, the law for that purpose was repealed; the repealing act declaring—that it had been found inexpedient, and not to answer the purposes intended by the legislature. In fact, the esta-

(63) Passed 30th March, 1793.

(64) Mr. Rittenhouse continued to hold the place of a trustee of the loan-office more than ten years; but on the 1st of April, 1790, a law was passed, by which all the powers and duties of the trustees of that institution were transferred to, and vested in, the treasurer of the state.

blishment of banks in the interior of the country, not only supplies the place of a loan-office, in relation to the farmer, but greatly facilitates the extensive inland trade of the state. Experience has demonstrated, that, operating in this way, they are productive of all the important advantages of the loan-office system : and of this institution, the late governor Pownall speaks in these remarkable words—" I will venture to say, that there never was a wiser or a better measure ; never one better calculated to serve the uses of an increasing country ; that there never was a measure more steadily pursued, or more faithfully executed, for forty years together,⁽⁶⁵⁾ than the loan-office in Pennsylvania, formed and administered by the assembly of that province."⁽⁶⁶⁾

(65) The loan-office system was kept up, in Pennsylvania, thirty years after governor Pownall wrote.

(66) Paper-money was not so well managed in some of the other colonies, where it was issued in too large quantities, and its credit not established on funds sufficiently stable and secure ;* a circumstance which induced the parliament of Great-Britain to interdict, for a time, further emissions of that sort of money, called bills of credit, by the provincial legislatures.

Although the last emission of loan-office bills of credit, under the colonial government of Pennsylvania, was made in the beginning of the year 1773, the want of this succedaneum for gold and silver, as a circulating medium of commerce commensurate to the increased population and trade of the country, was experienced some considerable time before. In a letter written by the Hon. Mr. T. Penn to the Rev. Mr. Barton, dated, London, June 17, 1767, the writer says :

" Your account of the increase of the growth of hemp, gives me great pleasure ; and I think the demand there has been for

* See Note 58.

In the year 1782, Mr. Rittenhouse was elected a Fellow of the Academy of Arts and Sciences, of Boston : his certificate bears date the 30th of January, in that year. This academy, which Dr. Morse ranks among the first literary institutions in the state of Massachusetts, holds a very respectable station in relation to science : yet it was not established till so lately as May 4, 1780. The end and design of the institution are stated to be—"to promote and encourage the knowledge of the antiquities of America, and of the natural history of the country, and to determine the uses to which its various natural productions may be applied : also, to promote and encourage medical discoveries, mathematical disquisitions, philosophical enquiries and experiments; astronomical, meteorological and geographical observations, improvements in

wheat, since the date of your letter, must have made the country people rich, even those who were poor before : it will prevent people being under the necessity of parting with their lands, and going to Carolina. Their produce will always bring them money at Philadelphia, notwithstanding there may be some more need for paper-money; yet, when trade is brisk, it circulates faster, and a less quantity will carry on a greater trade : however, I hope, in the next session of parliament, we may get the law which prohibits our making any more, repealed."

The parliamentary restriction was, in fact, afterwards taken off; and an effort was made, in the beginning of the year 1770, by the legislature of Pennsylvania, to enact a loan-office law, for the purpose of putting in circulation a further emission of paper-money : but the measure then miscarried, in consequence of some disagreement between the governor and the general assembly respecting the right they severally claimed, of appointing the trustees of the proposed loan-office.

agriculture, arts, manufactures, commerce, and the cultivation of every science that may tend to advance a free, independent and virtuous people."⁽⁶⁷⁾

It is supposed to have been somewhat about this time, that Mr. Rittenhouse exercised his ingenuity upon an object, which, though not of great importance, is nevertheless a matter of considerable utility and some curiosity; the invention of an Hygrometer, made wholly of wood. The simplicity of the construction of this instrument, renders it easily attainable by almost every one; and as it is found to answer, very well, the end for which more expensive instruments are often employed, it may be considered as being more generally useful. Descriptions of the construction, and principle of operation, of this Hygrometer, having been furnished to the writer through the obligingness of two of his friends,⁽⁶⁸⁾ a very concise account

(67) The number of members in the Boston Academy is never to exceed two hundred, nor to be less than forty. By being limited to so moderate a number as the former, for the greater extreme, this academy will be likely to select suitable persons for the honour of fellowship, with the more discriminating circumspection.

(68) Robert Patterson, Esq. Director of the Mint, and David Rittenhouse Waters, Esq. a gentleman bred to the law, and a grandson of the late Dr. Rittenhouse.

The decease of Mr. Waters happened soon after: he died on the 4th of September, 1813, at the premature age of twenty-two years. Although he had just entered on the threshold of the world, this excellent young man exhibited many proofs of extra-

of it, drawn up from those descriptions, is given in the Appendix.

A circumstance shall be noticed in this place, which, although trivial in itself, will serve to shew the grateful sense entertained by our Philosopher of the merits of General Washington. It appears, that just about the time when the provisional articles of peace, concluded on between the United States and Great-Britain, were made known in America, Mr. Rittenhouse had forwarded to the General, at the head-quarters of the army, a pair of spectacles, and reading glasses,—as a small testimonial of his respect for the character and services of that great man. The terms of the letter that accompanied this little present, are not known to the writer of these memoirs; but, of what complexion they were, may be inferred from the General's answer, which is in these words :

“Newburgh, 16th Feb. 1783.

“Sir,

“I have been honoured with your letter of the 7th, and beg you to accept my sincere thanks, for the favor conferred on me, in the Glasses—which are very

ordinary attainments in literature and science, as well as of a superior genius. He appeared to have inherited from his maternal grandfather, congenial talents. In his life, his amiable disposition endeared him to all who had an opportunity of knowing his virtues: in his death, not only have his relatives and friends experienced an afflicting bereavement, but his country has sustained the loss of a citizen of great promise.

fine; but more particularly, for the flattering expressions which accompanied the present.

“The Spectacles suit my eyes extremely well—as I am persuaded the Reading-Glasses also will, when I get more accustomed to the use of them. At present, I find some difficulty in coming at the proper focus; but when I do obtain it, they magnify perfectly, and shew those letters very distinctly, which at first appear like a mist—blended together and confused. With great esteem and respect, I am, Sir, your most obedient and humble servant,

“GO. WASHINGTON.

“DAVID RITTENHOUSE, Esq.”

The grinding and polishing of the glasses were of Mr. Rittenhouse's own workmanship; and they were made for the purpose. This circumstance, added to the manner and occasion of their being presented, could not fail of being highly acceptable to the General.

In the year 1784, Mr. Rittenhouse was employed on the part of Pennsylvania, for the purpose of determining the western extension of that state; and was associated in that business with Mr. Lukens, Dr. Ewing, and Capt. Hutchins: the commissioners in behalf of Virginia were Dr. (afterwards bishop) Madison, Mr. Ellicott,⁽⁶⁹⁾ Mr. J. Page, and the Rev. Mr. R. An-

(69) Although Mr. Ellicott is a native of Pennsylvania, and was a citizen of that state until the British army took possession of Philadelphia, in 1777, he resided in Baltimore county about eight years after that event.

draws. A record of the astronomical observations which were made on this occasion, and on similar ones of an important nature, will be found detailed in a letter, under the date of April 3, 1795, addressed by Mr. Ellicott to Mr. Patterson, in the fourth volume of the *Am. Philos. Society's Transactions*. Among the observations contained in the first part of that letter, are those of the immersions of the satellites of Jupiter, taken at Wilmington on the Delaware, by Messrs. Rittenhouse, Lukens, Page and Andrews, at divers days from the 1st to the 23d of August, in the year 1784; together with those taken at the western observatory by Messrs. Ellicott, Ewing, Madison and Hutchins, at divers days from the 17th of July to the 19th of August: also, the emersions of those satellites by the same eastern observers, from the 29th of August to the 19th of September; and by the same western observers, from the 27th of August to the 19th of September; all in the same year.

“After the determination,” says Mr. Ellicott, “we completed the southern boundary of Pennsylvania; it being likewise the north boundary of Maryland, and a part of Virginia; and which had been carried on some years before,⁽⁷⁰⁾ by Messrs. Mason and Dixon, the distance of 242 miles.” This line is in the parallel of $39^{\circ} 43' 18''$ North latitude.⁽⁷¹⁾

(70) In the years 1767 and 1768.

(71) The difference of $16' 42''$, between the latitude above mentioned and the beginning of the 40th degree of north lati-

It was at the close of this year, that the college of William and Mary, in Virginia, complimented Mr. Rittenhouse with an honorary degree of Master of Arts, by an unanimous vote of the rectors and faculty of that institution. His diploma, which is a special one, and wherein he is styled the Chief of Philosophers,⁽⁷²⁾ has a place in the Appendix.

The college of William and Mary was founded in the joint reign of the king and queen of those names, who endowed it with twenty thousand acres of land, besides a small duty on certain exported tobaccos, granted by stat. 25 Ch. II: in addition to which, the assembly of Virginia also gave to it, by temporary laws, a duty on liquors imported, and on skins and furs exported. And from these resources, its funds amount-

tude, (which was the southern limit assigned to Pennsylvania, by her charter,) was gained by Mr. Penn, as far as the northern boundary of Maryland extended westward, in consequence of a compromise entered into by him and Lord Baltimore; whereby the latter obtained some advantage on his part in return. From the western extremity of this northern boundary of Maryland, the line between Pennsylvania and Virginia was continued, westward, in the same parallel of latitude, (instead of these coming back to the 40th deg. of N. lat.) by virtue of an agreement between these two states; the former, in consideration of that privilege, relinquishing her right to run her western boundary line parallel to the meandrings of the river Delaware.

(72) "Principem Philosophorum," in the original:—Such was the appellation (Principes Philosophorum) by which Cicero honours Pythagoras, Democritus, Plato, Xenocrates, Zeno, Cleanthes, Diogenes the Stoic; men, among others, whose usefulness (he observes) old age might diminish, but not destroy.

ed, on a medium, to more than 3,000*l*. Virginia currency, (or \$40,000,) per annum. The Hon. Robert Boyle,⁽⁷³⁾ of England, had also made a liberal donation to this college, for the purpose of instituting a professorship, called the Brafferton, (the name of the English estate, purchased with the money granted by him to the college,) for the purpose of compensating mission-

(73) Mr. Boyle was the seventh son of Richard, the first earl of Cork, in Ireland, and first earl of Burlington, in England; and was born at Lismore in Ireland, the 26th of January, 1726-7. This eminent philosopher and sincere Christian established, by his will, in the year 1691, a perpetual fund, equivalent to about two hundred and twenty-two dollars per annum, for instituting a course of eight sermons or lectures, to be delivered annually; designed to prove the truth of Christianity, generally, without engaging in any of the controversies subsisting among its professors: And to this establishment, denominated *Boyle's Lectures*, the world are indebted for many able and elaborate defences both of natural and revealed religion. In addition to several extensive benefactions, for charitable and religious purposes, of this great and excellent man, besides his donation to the College of William-and-Mary (which, according to Mr. Jefferson, was "considerable" in its amount,) he gave, in his lifetime, a sum equivalent to thirteen hundred and thirty-three dollars, towards propagating the Christian Religion in America. So great was his veneration for the name of God, that he never pronounced it without a discernible pause: he was steady in his secret addresses to the throne of heaven: and, amidst all his enquiries into nature, his chief design seemed to be that of continually elevating his own mind, and the minds of others, by contemplating the Glory, the Wisdom, and the Goodness of God. Were this illustrious man to be considered in no other point of view, than that of a benefactor to America, his memory would be entitled to respect in this country: but his virtues, his talents, and the services he has rendered to mankind in general, will for ever endear his name to the good and wise of all nations. He died the 30th of December, in the year 1691.

aries, to instruct the Indian natives and to convert them to Christianity. After the revolution, the constitution of the college of William and Mary underwent a considerable change: three of the six original professorships, that is to say, two of Divinity, and one of the Greek and Latin languages, were abolished; and three others, namely, one for Law and Police—one for Anatomy and Medicine—and a third for Modern Languages, were substituted in their stead; the Brafferton, it is presumed, has been diverted into other channels, if not wholly neglected.

4. This once respectable college, or university, is at present in an unprosperous condition; and will not probably soon, if ever, regain its former reputation. A country of which a large portion of the population consists of slaves, is ill suited for the site of an extensive seminary of learning, and for the education of youth: nor can it be expected, that where an almost despotic sway of masters over their slaves⁽⁷⁴⁾ is daily exhibited to the view

(74) The author of a poem, entitled, ‘The Dying Negro,’ has introduced these lines into that poem:*

“Oft have I seen them, at the break of day,
“Rous’d by the lash, go forth their cheerless way.”

No man ever held the slave-trade, and the condition of the hapless people who are the objects of that nefarious traffic, in greater abhorrence, than the benevolent Rittenhouse: a passage in his Oration, fully evinces his sentiments on this subject.

In addition to this highly respectable testimony against Negro Slavery, let it be remembered, that one of the last acts, of a pub-

* It was written by Mr. Day, the friend of Mr. Darwin.

of both young and old, the children of those masters will submit to that degree of subordination, and to that exercise of authority by their literary preceptors, which the discipline of an academic education renders indispensable. The late Bishop Madison contributed much by his abilities, his suavity of manners and his prudence, to maintain a due degree of order in this institution, over which he long presided with distinguished reputation; but the death of that respectable man, it is feared, augurs ill for the future prosperity of the seminary.

In the year following, the tracing of a meridian, northward, for the western boundary of Pennsylvania, —and, consequently, the eastern boundary of part of Virginia,—was commenced, from the western end of the southern line of Pennsylvania before mentioned. On this occasion, Mr. Rittenhouse addressed the following letter to Mr. Ellicott.

“ Philadelphia, April 26th, 1785.

“ Dear Sir,

“ For some months past I had not the least apprehension of being obliged to visit the Ohio, this spring;

lic nature, in which our philosopher’s predecessor* was concerned, was to sanction with his name the Memorial presented to the government of the United States, on the subject of the Slave-Trade, by “ The Pennsylvania Society for promoting the Abolition of Slavery, and the relief of free Negroes, unlawfully held in Bondage;” of which Society, that distinguished man was the President.

* Dr. Franklin.

but our affairs have taken such a turn, that at present it is probable I shall meet you, at the time and place appointed. Capt. Hutchins has been sent for to New York, by Congress, as the trustees of the university will not consent to Dr. Ewing's absence. One or other of us will certainly set off in a few days, to meet you: our waggons are already gone.

“I have earnestly recommended to council to commission you to act in behalf of Pennsylvania,⁽⁷⁵⁾ after we pass the Ohio; and the president directs me to inform you, that they mean to send you a commission for the purpose: I hope it will suit your convenience.

“I ought long since to have informed you, that you were elected a member of our Philosophical Society—I wish you would favour us with a communication, on any subject you please. Pray let me hear from you, before you leave Baltimore. Have you any account from Virginia? I am, dear sir, yours with respect and sincerity.

“DAVID RITTENHOUSE.

“ANDREW ELLICOTT, Esq. Baltimore.”

This boundary-line was begun in May, 1785, by Messrs. Rittenhouse, Ellicott, Porter, and Nevill;

(75) Mr. Ellicott being a commissioner for Virginia, his powers would have ceased, as soon as the boundary-line between that state and Pennsylvania had reached the river Ohio. The object, therefore, was to enable him to complete it, to its western extremity.

assisted by the present Dr. Benjamin Smith Barton, then a youth about nineteen years of age, whose medical and other scientific acquirements rendered him, even at that early period of life, an useful associate of the commissioners. Mr. Nevill (who was employed on the part of Virginia) left the other commissioners late in August; and Mr. Rittenhouse, about the middle of September.⁽⁷⁶⁾ Dr. Barton remained until some time in October, when these operations ceased for that season. The line then wanted about 55½ miles of being completed: and this part of it, to its intersection of the margin of Lake Erie, was finished in the

(76) The following report of the progress of their work was made by the commissioners, to the government of Pennsylvania, between three and four weeks before Mr. Rittenhouse set out on his return to Philadelphia: it is entered on the journal of the general assembly of that state, under the date of Nov. 2, 1785.

“We the subscribers, commissioners, appointed by the states of Pennsylvania and Virginia, to ascertain the boundary between the said states, do certify, that we have carried on a meridian line from the south-west corner of Pennsylvania, northward, to the river Ohio; and marked it, by cutting a wide vista over all the principal hills intersected by the said line, and by falling or deadening a line of trees, generally, through all the lower grounds. And we have likewise placed stones, marked on the east side, P. and on the west side, V. on most of the principal hills, and where the line strikes the Ohio; which stones are accurately placed in the true meridian, bounding the states as aforesaid.”

“Witness our hands and seals, this 23d day of August, 1785. (Signed,) DAVID RITTENHOUSE, ANDREW PORTER, Pennsylvania; ANDREW ELLICOTT, JOSEPH NEVILL; Virginia.”

following year, by Col. Porter and Alexander Machin, Esq.⁽⁷⁷⁾

It will be readily conceived, that a person of Mr. Rittenhouse's delicate constitution, and regularity in his mode of living when at home, must have experienced much inconvenience and felt many privations of comfort, while climbing rugged mountains, traversing vast uncultivated forests, and sleeping in a tent, for successive months, as he was necessarily obliged to do, when employed on occasions of this kind. For, although the government afforded to the gentlemen engaged in these arduous services, very liberal accommodations, there were, nevertheless, numerous conveniencies which the nature of the duty to be performed rendered unattainable. Yet it is a fact, that Mr. Rittenhouse always returned from these excursions with a better stock of health, than he sat out with; notwithstanding the hardships he sometimes endured, and the many unpleasant circumstances in regard to weather, diet, bedding, &c. which he was compelled to encounter. The two following letters, written by him to his wife, while he was engaged in the service of establishing the boundary-line last mentioned, will enable the reader to form a

(77) Mr. Rittenhouse had probably a reference to the expected completion of this line, perhaps to the whole business, generally, when, in a letter to Mr. Ellicott, of the 31st of Jan. 1786, he says; "I shall be able, some time hence, to write to you more fully about the boundary lines."

pretty good judgment of the kind of life he then passed. They will at the same time serve to shew, in some degree, the bent of his mind and the disposition of his heart.

The first of those letters, dated at "Wheeling Creek," June 30th 1785, is in these words.

"My dearest H,

"I have not heard one word from Philadelphia, since I left you. About a month ago I wrote to you from Union Town, and I promise myself a letter from you by the first messenger from that place, who is now daily expected. To-morrow Mr. Armstrong sets off for Hanna's Town, where he expects to meet brother Isaac Jacobs, so that I write in confidence of my letter reaching you.

"If I were to view only the dark side of my situation, I should complain that I am here secluded from the society of those I love, deprived of books and every other of my most favourite amusements; confined to homely fare by day, and a hard bed at night; and obliged, by our business, to take rather too much exercise. But these inconveniences are in some measure counterbalanced by several advantages: I am not condemned to hear that eternal din for money, which it pains me to think you are every day perplexed with;⁽⁷⁸⁾ politics have no existence here; constant

(78) Mr. Rittenhouse, being then treasurer of the state, alludes to those incessant demands on the treasury for money, which, by

and regular exercise causes me to sleep much better at nights, than I did at home ;—we have a woman to cook for us, so that our bread is good, and every thing else tolerable. Colonel Porter is attentive, and cousin Benjamin⁽⁷⁹⁾ has recommended himself as an agreeable companion, to all of us ; and I could almost call Mr. Ellicott a congenial soul.

“I ever delighted in a wild uncultivated country ; this is truly romantic, and, at this season of the year, beautiful and luxuriant in the highest degree. A few days ago, I walked up a little rivulet, in company with Mr. Ellicott, for a considerable distance, in order to enjoy the romantic scene. It was bounded on each side by steep hills of an immense height : its bottom

reason of the financial embarrassments of the government, at that period, could not be always punctually paid. The activity, and the very intelligent mind of Mrs. Rittenhouse, both prompted and enabled her to relieve her husband from much of the perplexity, which at that time attended the duties of state-treasurer. Indeed, it was owing to the great attention of that excellent woman to some of the more important transactions of the office, and her capability to manage and superintend the current business of that department of the public affairs, in the absence of her husband from home, or when incapacitated by bodily indisposition from personally attending, that the government was enabled to avail itself, in several instances, of the talents and services of Mr. Rittenhouse, in matters of high importance to the community, which required the aid of his abilities. On such occasions, he ever found Mrs. Rittenhouse a competent, as well as a most faithful assistant, in the business of the treasury.

(79) So he then used to call his nephew, the present Professor Barton.

was finely paved with large flag-stones, rising in steps, with, every now and then, a beautiful cascade. The further we went, the more gloomy and cool we found it. At last, I advised Mr. Ellicott that we should proceed no further; for, if we did, we should in all probability find some of the water-goddesses,—perhaps stark naked and fast asleep. Mr. A* * * * * went with us, for company-sake; but neither the nymphs nor their shady bowers have any charms for him.⁽⁸⁰⁾—Nothing but your company was wanting to me, to heighten the enchanting scene.

“Deer are incredibly plenty here—I was the first that caught a young fawn, and hoped to have sent the beautiful little animal a present to H* * * *. We kept it about a week, and it became quite tame; but our cows ran away, and it was starved for want of milk. Col. P. called it F—B—, and says H* * * * shall at least have the skin. We have all been very healthy; my cough diminishes slowly, my old complaint is less troublesome, and I have no other.

“I am not yet determined, as to the time of my return. Later than September, I have no thoughts of staying; perhaps the fear of riding in hot weather may induce me to stay till then.

“We have, hitherto, made so slow a progress, that I am much dissatisfied with it; but do not know how

(80) Mr. A. was a worthy and pleasant man: but, he was an old bachelor.

to help it. Our greatest difficulty arises from the nature of the ground ; and the idleness of the people of the country, is not the least. We have had about thirty men employed, and are not yet able to go more than a mile per day. I was about writing to the Vice-President, on this subject ; but, on second thoughts, concluded it best not to do it : I wish, however, that council would, by some official letter, urge us to proceed with all the dispatch consistent with the accuracy they expect.

“I wish to write to B* * * * and H* * * * ; but you will not readily imagine how little leisure I have : Tired of the exercise of the day, I rejoice at the approach of night ; and, after a cup of tea, generally lie down to rest as soon as it is dark, unless we have observations to make ; and then we have generally half a mile to walk, through dark woods, from the place of observation to our encampment : this, however, does not happen above once in a fortnight.

“Sun, gallop down the western skies ;
Go quick to bed, and quickly rise ;”

Until you bring round the happy day, that will restore me again to the dear woman and children I so much love.

“Give my love to my children, and the few friends that are really concerned for my welfare. God bless you, and make you at least as happy as I am ;

and then, I am sure, you will not complain. Your ever affectionate

“ D. RITTENHOUSE.

“ Mrs. HANNAH RITTENHOUSE.”

The other letter, dated at the “ Head Waters of Buffalo,” the thirteenth of July, is as follows.

[“ My dearest H,

“ I need not say how much I feel for you, on account of the disagreeable situation in which you last wrote. The only advice, I believe, which I thought it necessary to give you, at leaving you, was to keep up your spirits and endeavour to bear the fatigues of the office. What will you say, or what will you think, when I tell you, I believe it scarcely possible for any thing to contribute so much to reconcile me to your absence, as the aversion I have to the plagues of that same office.

“ You have heard the reports concerning the Indians. We are still ignorant of the true state of matters ; but, from every information we can get, it seems very improbable that we shall cross the Ohio this summer : on this side of the river, we do not apprehend the least danger.

R R

“On Saturday last, we suddenly emerged from the gloomy, uncultivated desert, into a habitable country; and encamped with joy in an open field where we could once more see the heavens around us,—a sight we had not been blest with, for five weeks past. Wheat, rye, and Indian-corn, growing, afforded a very pleasing sight; even the barking of dogs and crowing of cocks were agreeable. The next day being Sunday, several of the neighbours, their wives and daughters, paid us a visit; and amongst them, at least one spruce young lady, bred at the metropolis, Fort-Pitt.⁽⁸¹⁾ But would you believe it? such is my unreasonable and incurable aversion to company, that their visits soon became irksome. They hindered me from enjoying a lonely walk, or some passage in Milton,—or, perhaps, a loll on my bed. Nay, even our fellow-commissioners, the Virginians, I mean; I sometimes wish their wine was better, and flowed more plentifully: not that I might enjoy it with them; but that I might enjoy myself the more, alone.

“Whether you will believe me or not, I do not know; but my health is really much better. As I

(81) Now the flourishing borough of Pittsburgh, situated at the confluence of the rivers Allegany and Monongahela, which form, by their junction, the commencement of the great river Ohio.

This place, which is distant about thirty-five miles, eastward, from the western boundary-line of Pennsylvania, was the site of a fort, formerly erected by the French, which they called Fort Du Quesne; but on its reduction by the English, it was named by them Fort-Pitt; and by this name the place is still recognized by many people.

told you in my last, my old complaint is the only one I have; and this is, and has been for several weeks, infinitely more supportable, than I have known it for months together. I do not, indeed, flatter myself with a cure; it is, in all probability, fixed for life: but an alleviation of the pain I have usually felt, is to me of much importance.

“We have, for three weeks past, had a much greater proportion of dry weather; and in this country, when it does not rain, the sky is always fair, of a beautiful blue, and the air serenè. There has been nothing like a storm, nor scarce a puff of wind, since we came here. Though thunder, lightning, and rain, are so very frequent, they are never attended with high winds, nor scarcely a perceptible motion of the air. For a month past, we had a very decent woman to cook for us, but some little family broils obliged us to pack her home again. Our boys have, however, learnt from her to bake good bread, and to cook much better than they did. I mention this, because you will be pleased with any thing that can contribute to my comfort.

“I expect several opportunities of writing, before we reach the Ohio, none of which shall be neglected. I must lay down the pen, to retire to rest after the fatigues of the day. Wishing you a very good night, I conclude, &c. your ever affectionate

“DAVID RITTENHOUSE.

“MRS. RITTENHOUSE.”

“P. S. Having mentioned the fatigues of the day, I must assure you that I find my strength fully equal to them : As to walking up the hills, I never pretend to it, having always a horse to ride—Col. P. is every thing I could wish ; I mean, so far as is necessary to me.”

This arduous business of determining the territorial limits of several great states, which commenced before the American revolution, was not terminated until some years afterward. And on every occasion of that kind, where Mr. Rittenhouse's situation, in respect to health and official duties, admitted of his being employed, his talents placed his services in requisition.

He had been at home but a few weeks, after being engaged in running the Western boundary of Pennsylvania, before he was elected by Congress, together with the Rev. Dr. Ewing, and Thomas Hutchins, Esq. afterwards Geographer of the United States, a commissioner “for running a line of jurisdiction between the states of Massachusetts and New-York, conformably to the laws of the said states.” This appointment was made on the 2d day of December, 1785.⁽⁸²⁾ It was not, however, until the year 1787,

(82) By an agreement, entered into, on the 18th of May, 1773, between commissioners appointed by the legislatures of New-

that the legislature of New-York ceded to the state of Massachusetts all the lands within their jurisdiction, Westward of a meridian to be drawn from a point in the Northern boundary of Pennsylvania, eighty-two miles West from the river Delaware; excepting one mile along the Eastern side of the Niagara river; and

York and Massachusetts, respectively, for the settlement of a partition-line of jurisdiction between those (then) provinces, on the eastern part of New-York, and from the southern to the northern boundaries of Massachusetts, (then called Massachusetts's Bay ;) in compliance with the king's recommendations, which had been previously signified to sir Henry Moore, and Francis Barnard, Esq. the then governors of those provinces. The commissioners, on the part of New-York, were John Watts, Robert R. Livingston, and William Nicoll, Esq's. and on that of Massachusetts, William Brattle, Joseph Hawley, and John Hancock, Esq's. These gentlemen met, in pursuance of their appointment; at Hartford in the (then) province of Connecticut, where, after divers conferences, they concluded on the following line, as the one which should, at all times thereafter, be the line of jurisdiction between Massachusetts and New-York, wheresoever the latter, on its eastern boundary, should adjoin on the former: that is to say, beginning at a place fixed upon by the two governments of New-York and Connecticut, about the year 1731, for the north-western corner of a tract of land commonly called the Oblong, or Equivalent Land; and running from that corner, north, $21^{\circ} 10' 30''$ east (as the needle then pointed,) to the northern line of Massachusetts. This agreement was ratified by the governors of Massachusetts and New-York, on the same day; and commissioners were accordingly appointed by both provinces, before the revolution, to run the line thus defined. It was, in part, then effected; but those commissioners not having been able to proceed, by reason of an eventual disagreement between them, this line was finally run out, surveyed, ascertained and marked, by the commissioners appointed by congress, whom the two governments concerned had empowered to make such appointment.

also ten townships between the Chenengo and Owegy rivers ; reserving the jurisdiction to the state of New-York : a cession which was made to satisfy a claim of Massachusetts, founded upon their original charter.

This line was accordingly run, in the year 1787, by the commissioners so appointed for the purpose :— And “this last business, which was executed with his usual precision and integrity”—says Dr. Rush, speaking of Mr. Rittenhouse,—“was his farewell peace-offering to the union and happiness of his country.”

It was not until the year 1786, that the American Philosophical Society were enabled to publish a second volume of their Transactions :⁽⁸³⁾ it then made its appearance. Into that volume is introduced a letter to the Society, in the original Latin, (accompanied with an English translation,)⁽⁸⁴⁾ from the celebrated

(83) In the beginning of the same year, Mr. Rittenhouse was elected one of the twelve Counsellors of the American Philosophical Society ; an office in that institution, created by the incorporating act of the 15th of March, 1780.

(84) There was some unaccountable mismanagement in the whole of this business, on the part of the society. Mr. Mayer's letter is published entire, in the original Latin : but the translation ends, abruptly, in the middle of a paragraph. When Mr. Rittenhouse was directed by the society to answer that letter, he requested the writer of these memoirs to furnish him with an English translation of it, for the purpose of comparing with it

C. Mayer, the Elector Palatine's⁽⁸⁵⁾ Astronomer at Mannheim, dated so long before as the 24th of April, 1778. The receipt of that letter had been acknowledged by Mr. Rittenhouse, according to a special order of the Society, so early as the 20th of August, 1779; and the answer, it is presumable, was duly transmitted to Mr. Mayer. Yet, although there was a lapse of seven years, from the date of Mr. Rittenhouse's letter to the time of Mr. Mayer's communication being printed in the Society's Transactions, the former was, by some unaccountable circumstance, omitted and unnoticed! Nor will the reader's surprise on this occasion be diminished, when he learns, that a member of the Society, having obtained from Mr. Rittenhouse a copy of his letter, had it read at their stated meeting on the 16th of March, 1792,—

one which he had himself attempted. That translation (which, by Mr. Rittenhouse's desire, was made to conform pretty closely to the original,) is inserted in the Appendix, entire, together with the hitherto unpublished answer.

(85) Charles Theodore, Duke of Bavaria, who is denominated by Lalande, "an illustrious patron of the sciences."

It is about fifty years since this prince built an observatory near the gardens of Schwetzingen, two leagues from the city of Mannheim; and there Father Christian Mayer pursued his astronomical labours for several years. But about the year 1772, the same prince erected another and a more magnificent edifice (of 108 Rhenish feet in height,) at Mannheim, for the same purpose: where Father Mayer made numerous and highly estimable observations; as may be collected from his work, entitled, *De novis in Cælo Siderio Phenomenis*. Lalande places this observatory in N. Lat. 49° 29' 15".

twelve years and a half after its date; that it was, thereupon, "referred to the committee of selection and publication :—" and, notwithstanding, by some other fatality, that letter remained unpublished until now; being twenty-one years afterwards!

On a perusal of the answer to Mr. Mayer's communication (in the Appendix,) it will be found, that the "eminent utility," which he expected to result, at some future day, to astronomical science, from a prosecution of such discoveries as he had recently made among the fixed stars, had been long before anticipated by our Astronomer. In that answer Mr. Rittenhouse mentions, that he is induced to request his correspondent's acceptance of a copy of the Oration he had delivered before the American Philosophical Society, "some years" before :—"because," says the writer, "I therein gave my opinion, that the fixed stars afforded the most spacious field for the industry of future astronomers; and expressed my hopes, that the noblest mysteries would sometime be unfolded, in those immensely distant regions."

This early opinion of his own concerning the fixed stars, to which Mr. Rittenhouse refers in his letter, is expressed in his Oration, in this short paragraph : "If astronomy shall again break those limits that now confine it, and expatiate freely in the superior celestial fields,—what amazing discoveries may yet be made among the fixed stars! That grand phenomenon the

Milky way, seems to be the clue, that will one day guide us."

Such were the expectations entertained by our Philosopher, more than three years before the date of Mr. Mayer's communication of his discovery to the Philosophical Society;—a discovery which Mr. Rittenhouse, in his letter to that great astronomer, styles "excellent;" and one that proves his own "presage" to have been well founded. He, at the same time, modestly suggests to Mr. Mayer, the institution of a comparison between the many observations he had already made, in order to determine, whether the several changes observed will agree with any imagined motion of our system; remarking, that those he had communicated, seemed to favour such a supposition.

How important soever, in relation to astronomy, the phænomena observed by Mayer may be, the honour of first discovering them certainly belongs to him. Mr. Rittenhouse was not the discoverer: nor had he ever access to so complete and expensive an astronomical apparatus, as that used by Mayer on the occasion, and with which he was furnished by means of princely munificence. But all candid men of science will, nevertheless, be disposed to allow the American Astronomer no inconsiderable share of merit for the early "presage," which his deep-discerning and vastly comprehensive mind enabled him to suggest, of some such future discoveries.

The writer of these memoirs deemed it his duty to do justice to the memory of the subject of them, by giving publicity to these interesting circumstances; and the performance of this duty is the more gratifying to the writer, because he alone possesses a knowledge of all the facts he has stated, concerning them.

The late discoveries of Dr. Herschel, among the fixed stars, in addition to those previously made by Mr. Mayer, have in a greater degree realised the expectations which were formed, many years before either, by our Astronomer; such, indeed, as are almost entitled to the character of prescient annunciations, respecting that portion of the heavens which should, some time or other, be the scene of the most important astronomical discoveries. According to Herschel, the Milky Way is an immense nebula, near one of the sides of which, is placed the solar system; and he imagines, that each nebula, of which he had observed more than nine hundred, consists of a group of suns, with their attendant planets!

Mr. Rittenhouse never possessed the means of acquiring such stupendous and costly telescopes, as those used by Herschel, for the purpose of exploring the heavens. But the penetrating genius of our countryman seems to have contemplated, by anticipation, the actual existence of those sublime phænomena, some of which the vastly superior instruments of the Germano-Anglican Astronomer have since manifested; when,

in language apparently prophetic, but certainly dictated by the most exalted pre-conceptions of the grandeur of celestial objects which were yet undiscovered, the American Philosopher observes, as he does in his Oration,—that “all yonder stars innumerable, with their dependencies, may perhaps compose but the leaf of a flower in the Creator’s garden, or a single pillar in the immense building of the Divine Architect.” Well might he exclaim, with rapturous extacy, after so beautiful and sublime a reflection,—“Here is ample provision made for the all-grasping mind of man !”

It will be evident to such as duly reflect on this subject, that those expectations which occupied the mind of Mr. Rittenhouse, so long since as the year 1775—concerning the “amazing discoveries” which should, at some future period, be made among the fixed stars, were not mere conjectures or vague hypotheses ; but, that they were rational anticipations of realities, founded on the most acute observation and laborious research, as well as the profoundest philosophical judgment. As Newton is said to have revealed those truths in physics, which his predecessor, Bacon, had pre-conceived ; so, that great practical astronomer, Herschel, and some other eminent observers of our day,⁽⁸⁶⁾

(86) Among those who have observed, since Dr. Herschel’s discovery of the *Georgium Sidus*, new phænomena in the heavens, may be ranked the following :

M. Piazzi, a Sicilian astronomer, who, on the 1st of January, 1801, discovered a small planet revolving round the sun, between the orbits of Jupiter and Mars, named *Ceres* :

have been enabled, by means of the very important improvements recently made in astronomical instruments,⁽⁸⁷⁾ to verify a grand hypothesis in his favourite

Dr. Olbers, of Bremen, who, on the 28th of March in the following year, discovered another small planet, to which he gave the name of Pallas, which revolves round the sun nearly at the same distance, and in the same time, as Ceres; and afterwards, viz. on the 29th of March, another planet, which he called Vesta; similar to the others, both in its position and magnitude: and

Mr. Harding, of Lilienthal, who, between these two last mentioned periods, viz. on the 1st of September, 1804, discovered a fourth planet (but the third in the order of time,) also small, to which he gave the name of Juno; resembling Pallas in a great excentricity of its orbit, and the inclination of this to the ecliptic, and placed at nearly the same distance from the sun.

The Georgium Sidus was not discovered until about fifteen years before Dr. Rittenhouse's death; and the first discovered of the four last mentioned planets was not known in America, for almost five years after that event.

(87) "There is perhaps no individual of the present age," (says the writer of the article "Astronomy," in the New Edinburgh Encyclopædia, now publishing under the direction of Dr. Brewster,) "to whom practical astronomy owes deeper and more lasting obligations, than to Mr. Edward Troughton. The great improvements which he has made upon astronomical instruments, and the extreme accuracy with which he divides them, have rendered his name celebrated in every part of Europe, and have inspired the practical astronomer with a confidence in his observations, which he had hitherto been unaccustomed to feel. There is scarcely an observatory of any consequence, either in this country" (Great-Britain,) "or the continent, that does not contain some of Mr. Troughton's instruments; and there are few series of observations, in which they have not been used. The admirable observations of Mr. Pond, on the declinations of the principal stars, were made with an azimuth circle of Mr. Troughton's construction. The mural circle, which Mr. Groombridge of Blackheath uses, in his numerous and accurate observations, was made

science, which had long before been conceived by the towering genius of Rittenhouse.

From the time our astronomer became established in Philadelphia, until the year 1787, he resided in a house belonging to the late Mr. Thomas Clifford, at the south-east corner of Arch and (Delaware) Seventh streets : But the mansion which Mr. Rittenhouse had erected for himself, the preceding year, on his Observatory-lot at the diagonal corner of those streets, being then compleated, he removed thither ; and there continued his residence, during the residue of his life. It was about this time, perhaps towards the close of the year 1786, that he was compelled by the duties of his office, as sole trustee of the loan-office, to put in suit the bonds which accompanied the mortgages of sundry delinquent loanees. The bonds were placed in the hands of the Writer of these Memoirs, for that purpose ; with instructions to treat the delinquents with every reasonable degree of forbearance. This lenity was observed, agreeably to Mr. Rittenhouse's desire ; few suits were instituted, and payment of the monies due, or the greater part of them, was not long after obtained.

by the same artist. The splendid mural circle, of 6 feet 2 inches radius, which Mr. Troughton is at present preparing for the Royal Observatory at Greenwich, will cost 700*l*." (equivalent, in money of the United States, to \$ 3111 $\frac{11}{100}$.) "and will be one of the most magnificent and accurate instruments that has ever been erected."

Early in the year 1787, the expected appearance of a new comet in that year, engaged Mr. Rittenhouse's attention : and on that occasion he addressed the following letter to Mr. Ellicott.

" Philadelphia, Feb. 12, 1787.

" Dear Sir,

" The elements of the new Planet have been pretty well determined by several European astronomers. The following I have extracted from the Almanac for 1787.

Mean Longitude	4 ^h 2° 21' 58"	} To Dec. : 1787, at no. Paris.
Mean Anomaly	4 8 53 56	
Place of Aphel.	11 23 28 2	
Ascending Node	2 12 52 54	

Mean Motion in Long. in 365 days	4° 19' 47.
in 30 days	21' 21"
in 24 hours	42".7

" The Aphelion and Nodes move according to the precession of the Equinoxes ; that is 50".3 per ann.
Inclination of the Orbit 46' 13"

Log. of greatest distance from the Sun	6.3007701
Log. of least distance	6.2594052
The Log. of the Earth's mean dist. from ☉ being	5.0000000

(88) The Nautical Almanack.

“Dr. Halley’s Table of the equation of π ’s orbit will do very well for computing the place of Herschel’s planet, only subtracting $\frac{1}{11}$ part of the equation there found ; the greatest equation of this planet being $5^{\circ} 27' 16''$. So, if from the Log. to any degree of anomaly, in the Table for Jupiter, we subtract $\frac{1}{11}$ part of the excess of that Log. above the least, and to the remainder add the constant Logarithm .5647750, we shall have the Log. for π sufficiently accurate. On these principles, I have computed the Right Ascension of π , and find both agree with my own observation, to a few seconds.

“ I am sorry you have engaged the notice of *****. Men of his principles, with a printing-press at command, are the greatest pests of society.

“My very bad state of health, and a multiplicity of business, have prevented my answering yours as soon as I wished to have done it. I am, Dear Sir, your Friend and Humble Servant,

“DAVID RITTENHOUSE.

“ANDREW ELICOTT, Esq. Baltimore.”

The correctness of the calculations respecting the Georgium Sidus, stated in this letter, is noticed in the following extract from one of Mr. Ellicott’s Almanacks.

“The reader will find in this Almanack a continuation of the planet π . The elements on which the calculations were made, appear by observation to be very accurately determined, not only by the astronomers in Europe, but by my ingenious friend Mr. Rittenhouse, whose knowledge of the theory and practice of astronomy, is not surpassed in the old world.”

From this time, until his resignation of the treasurership of Pennsylvania in the autumn of 1789⁽⁸⁹⁾, Mr. Rittenhouse appears to have continued to be pretty much engaged in the duties of that office. A short time before this event, the Writer of these Memoirs visited the city of New-York; where the first congress, chosen under the present constitution of the United States, were then convened, having commenced their session on the fourth day of March preceding: and on that occasion, Mr. Rittenhouse addressed a letter to General Washington, then President of the United States, recommendatory of his friend and nephew. Delicacy forbids this relative to present to public view that portion of the letter, which more especially relates to himself: but the introductory part of it is here presented to the reader, for the purpose of testifying the continuance of the high esteem entertained for the truly great man to whom it was ad-

(89) In this interval, that is to say, towards the close of the year 1788, Dr. Rittenhouse's eldest daughter was married to the late Jonathan Dickinson Sergeant, Esq. of Philadelphia.

dressed, by one who never disguised his sentiments. This extract is as follows :

“ Philadelphia, Aug. 14, 1789⁽⁹⁰⁾

“ Sir,

“ However unwilling I am to add to that multitude of letters which must encroach so much on your precious time, I cannot altogether forbear, without doing violence to my feelings. As we have, all of us, through the course of life, been greatly indebted to the good offices of others ; so we are no doubt under obligations to perform the same in our turn, as well with respect to our particular friends, as society in general.

(90) A few days after this date (about the 20th of August,) the writer of these memoirs was nominated by the president to the senate, and by their advice and consent thereto was appointed, to be one of the judges of the western territory (now the state of Ohio, &c.): the other judges, nominated and appointed with him, were Samuel Holden Parsons and John Cleves Symmes, Esquires. Major-General Arthur St. Clair, who may, in some respects, be considered as a modern Bellisarius, was at the same time appointed, in like manner, to be governor of that territory.* The writer declined the honour intended for him by this appointment, which was unsolicited on his part: he resigned it in a day or two after.

The promptitude with which this mark of president Washington's approbation of the person recommended to him by Mr. Rittenhouse, was bestowed, is an evidence of the respect in which the president held that gentleman's recommendation ; and it is the more so, as Mr. Rittenhouse's letter was the only one addressed to the president on that occasion.

* For many interesting particulars concerning the sufferings and ill-requited services of this respectable veteran—of a man who once filled the chair of congress, and uniformly possessed the friendship and confidence of WASHINGTON, see his *Narrative*, lately published.

T t.

“Mr. William Barton, my sister’s son, knowing that you have heretofore honoured me with your acquaintance, I might, perhaps, say friendship, is willing to believe that any thing I can say in his favour, might have some weight with your Excellency.—

* * * * *

“Wishing your Excellency every happiness, I have the honour to be, Sir, with the greatest respect, your most obedient humble servant,

“DAVID RITTENHOUSE.

“His Excellency the President of the U. States.”

On the 10th of November, 1789, the following letter from Mr. Rittenhouse, offering his resignation of the office of treasurer of the state, was presented to the general assembly; and, after having been twice read, was, by order of the house, entered on their minutes.

November 9, 1789.

“Sir,

“On account of the very unfavourable state of my health, as well as because I most earnestly wish to devote some of the few remaining hours of my life to a favourite science, I find myself under the necessity of declining the office of treasurer.

“I have now held that office for almost thirteen years, having been annually appointed by the unanimous voice, so far as I know, of the representatives of the freemen of this state; a circumstance I shall ever reflect on with satisfaction, and which does me the greatest honour.

“I will not pay so ill a compliment to those I owe so much, as to suppose the principal motive in these repeated appointments was any other than the public good; but I am nevertheless very willing to believe, that a regard to my interest was not wholly out of view. And I shall, perhaps, never have another opportunity of expressing, with so much propriety, my sincerest gratitude to the representatives of my countrymen, whose favour I have indeed often experienced on other occasions.

“I accepted the treasury, when it was attended with difficulty and danger, and consequently when there was no compensation for it. Soon afterwards, a depreciated currency, prodigiously accumulated, made it extremely burthensome, without any prospect of profit.

“In a more favourable situation of our affairs, it might have been lucrative, had not the very small commissions allowed by law, been scarcely equal to the risk of receiving and paying. In 1785, my commissions were increased, and the office was for some

time profitable; but the difficulties or remissness in collecting the public revenues, again reduced it to a very moderate compensation.

“If, however, the embarrassments of the office have, in general, been little understood by those not immediately concerned in it; if the emoluments of it have been greatly exaggerated in the public opinion; I am still the more obliged to the several assemblies, who, under these impressions, have nevertheless continued me so long their treasurer.

“The confidence of the public I have ever esteemed so invaluable a possession, that it has been my fixed determination not to forfeit it, by any voluntary act of impropriety. Where my conduct has been deficient in the discharge of my duty, I hope it will be imputed to want of ability, and not of integrity.

“Fully sensible of the importance of the office I have the honour to hold, I cheerfully commit it into the hands of those who properly are, and ever must be, the guardians of the public good. I am, sir, with great respect, your most obliged and very humble servant—

“DAVID RITTENHOUSE.

“The honourable the Speaker of the Assembly.”

From the commencement of the year 1777, at which period Mr. Rittenhouse was invested with the trea-

surership of his native state, until the month of September following, when its capital was actually possessed by the British army, that city was in imminent danger of an hostile invasion. When it was reduced to a moral certainty, that the speedy occurrence of such an event was inevitable, he had retired with the treasury (as before noticed) to Lancaster, as a place of security; where he remained until the succeeding summer: when, after the evacuation of the capital by the British forces, he returned thither, and replaced the treasury in its ancient seat. The time, therefore, at which he accepted the office of treasurer, was truly one of "difficulty and danger."

That it was not, for many years, a lucrative place, must be apparent from the ever memorable circumstance of the great and unexampled depreciation of that species of paper-currency, called continental money;⁽⁹¹⁾ which was the only circulating medium of the

(91) According to Dr. Ramsay, "the depreciation began at different periods in different states; but, in general, about the middle of the year 1777, and progressively increased for three or four years." In the first four or five months of 1780, it depreciated to 50 or 60 for one. "Its circulation," continues Dr. Ramsay, "was afterwards partial; but, where it passed, it soon depreciated to 150 for one. In some few parts, it continued in circulation for the first four or five months of 1781; but in this latter period, many would not take it at any rate, and they who did, received it at a depreciation of several hundreds for one."

Hist. Am. Revol.

"In October, 1779, it was resolved by congress, that no further sum in this paper-money should be issued, on any account what-

United States, until the year 1782, when the bank of North America went into operation. The vast accumulation in the treasury, of that depreciated and daily depreciating substitute for money, must necessarily have been "extremely burthensome" to the treasurer, and could not have afforded him "any prospect of profit," during the first five years of his tenure of the office. And it was not, in fact, until those last few years, which constituted the interval between the time of augmenting the commissions and his retirement from the office, that the treasurership was profitable to him. During the greater part of the time he held it, the profits of the office did not enable him to employ even a clerk: nor could he have performed the numerous and laborious duties of that station (such as they then were,) had he not been greatly assisted by

ever, than would, when added to the sum then in circulation, amount to 200 millions of dollars. In their circular letter of the 13th of September preceding, addressed to their constituents, congress asserted the practicability of redeeming all the continental bills at par, with gold and silver; and rejected, with indignation, the supposition that the states would ever tarnish their credit by violating public faith. "These strong declarations in favour of the paper-currency," says Dr. Ramsay, "deceived many to repose confidence in it, to their utter ruin." In addition to the amount of many millions of dollars, in paper-emissions of the several states, congress, soon after, actually continued to issue their own paper, until it amounted in the whole to the enormous sum of 200 millions of dollars! That which was of little value before, now became of less, and soon afterwards good for nothing. The inevitable consequence was, that thousands of meritorious citizens were entirely ruined, and others greatly injured in their property.

the assiduity, care and abilities, of an excellent woman—Mrs. Rittenhouse. Singular as this circumstance may appear, this notice of it seems due to the memory of an highly meritorious wife; while, on the other hand, it must be acknowledged, that it does not reflect any honour on the liberality of a great, wealthy, and populous state. Such a man as David Rittenhouse ought to have been otherwise employed, by a generous and enlightened public: the exercise of his transcendent talents, in works of great and permanent public utility, would not only have constituted services which would have entitled him to a bountiful remuneration; but such as would have conferred great additional benefits and honours on his country.

That he should have had, in thirteen years, successively, an unanimous annual vote for the office of treasurer, is a very strong testimonial of the exalted sense which his countrymen entertained of his integrity: it would have been so, under a popular government, at any period. But when it is considered, that, during the whole of the time he held the treasurership, the people of Pennsylvania were divided into two opposing parties, which sprung into existence with the adoption of the state-constitution of 1776, the unanimity of their representatives in favour of this individual, is still more conclusive evidence of his merits. Most of those men in the community, best acquainted with human nature, and practically versed in the science of politics, very early pointed out the radical defects of

the new frame of government ; and predicted the utter incompetency of that instrument, as they conceived, to promote the true interest and happiness of civil society. In a single legislative body, a plural executive, and in a limited duration of the judicial authority—consequently, an undue dependence of the judges on the executive for their re-appointment,—they foresaw these evils, which were too soon realized : and in a septennial council of censors, such as that constitution provided for,⁽⁹²⁾ they beheld a political chimera,

(92) The judiciary is the only department of government, in a republic, the officers of which ought (conformably to the principles of that form of government) to be permanent in their stations. Judges, in order to secure their independence, and thereby enable them to administer justice faithfully and impartially, should hold their offices *quamdiu se bene gesserint* : and, should they violate the condition of this tenure, the constitution should provide, as that of Pennsylvania, in conformity to those of the union as well as her sister-states, does, that they should no longer continue in office. Thus, this branch of the government would have formed the only safe and effectual check, against such unconstitutional attempts as might be made upon the chartered rights of individuals or the public, by either the legislative or executive power. But, unfortunately, the dependent nature of the judiciary, under the constitution of 1776, rendered it incompetent to that end. Hence, as was noticed by the writer of these memoirs on a former occasion,* “the framers of the first constitution of the state of Pennsylvania discovered the indispensable necessity of providing some tribunal for preserving the constitution entire. They accordingly instituted a periodical body, in the nature of a judicial inquest, and styled the council of censors ; whose duty it was, “to enquire whether the constitution

* In a pamphlet, entitled “The Constitutionalist ; addressed to men of all parties in the United States”—published in Philadelphia, in the year 1804.

at variance with common sense and the experience of mankind. Men entertaining these views, formed, of course, one of those parties.

had been preserved inviolate in every part; and whether the legislative and executive branches of government had performed their duty, as guardians of the people, or exercised other or greater powers, than they were entitled to by the constitution." "This censorial tribunal was, however, ill calculated to answer the purposes of its institution. It was, itself, a temporary body, appointed immediately by the people. In the alternation, and casual ascendancy, of different parties in the country, a contingency inseparable from the nature of a popular government, the council of sensors became the representatives of the passions, the prejudices, the political interests, of whatever party might happen to be the predominant one at the moment of their election. If this should prove to be the same party with that which had borne the sway, during the seven years immediately preceding their election, they would be disposed to sanction the proceedings of that party: otherwise, they would be likely to censure and pronounce unconstitutional, the official measures of an adverse party, without just cause, impelled thereto by a spirit of party-hostility.

"Under a government thus constituted, all would be uncertain and insecure. From the deficiency of one stationary and independent department in its administration, the rights of the people and the best interests of the state would, eventually, become the sport of opposite and contending parties; these rights and interests would be sacrificed at the shrine of some desperate and unprincipled faction; the constitution itself, destitute of any steady disinterested support against their machinations, would be overthrown: till, finally, the people, having no longer any rallying point of security for their persons or property, would be driven from anarchy and licentiousness into the arms of despotism.

"It is further worthy of remark, that the council of censors was an inefficient and a nugatory tribunal, in one most important particular: Numerous unconstitutional acts of the legislature might have been carried into effect, and have had their complete

The other was composed of the projectors of the constitution of 1776, and other speculative politicians; together with all those whom they were enabled to influence, through the medium of their prejudices, their inexperience or their interests.

These two parties continued to divide the state, until the adoption of the federal constitution. The great and multiplied evils which resulted to the people of the United States, after the restoration of peace, and which had also been severely felt during the greater part of the war, from the inefficacy of the original confederation of the States, had convinced all thinking men of the necessity of forming a more energetic national government, as the only remedy for those evils. And the actual formation of such a government, aided by the long experience which the citizens of Pennsylvania had then acquired, of the injurious effects of their own existing constitution, disposed them soon after to establish the present constitution of the state, which was done in convention on the 2d of September 1790; a form of government, free from the palpable errors of the preceding one, and much more consonant to the genius and spirit of the federal constitution.

It is, then, a very extraordinary circumstance, and one that reflects great honour on the character of Mr. Rittenhouse, that, in the long course of years during

operation, attended by the most unjust and ruinous consequences, before they could be even pronounced unconstitutional."

which the people of Pennsylvania were thus divided into two contending parties, he alone could unite the favourable opinion of both parties, respecting his superior claims to hold one of the most important offices in the government.

Although little more than six years and an half intervened, from the time of Mr. Rittenhouse's resigning the treasurership of the state, until the period of his decease, literary and other public honours then flowed in upon him. He enjoyed, likewise, the satisfaction of experiencing, during that short interval, multiplied proofs of the esteem in which his abilities and character were held, both at home and abroad. And, notwithstanding it appears to have been his wish, when he retired from the treasury, to decline for the future any official situation, or public employment of any kind, not connected with science; in order that he might, without interruption, devote the remainder of his life to his favourite pursuits; a variety of public trusts, some of them requiring arduous duties, were constantly pressed upon his acceptance.

Shortly before he resigned the treasurership, the degree of Doctor of Laws was conferred on Mr. Rittenhouse, by the College of New-Jersey: his diploma bears date the 30th of September, 1789. This respectable seminary had given him the degree of Master in the Arts, seventeen years before⁽⁹³⁾; and this new

(93) In September, 1772.

honour was a further pledge of the high estimation in which he continued to be held by the regents of the institution. His diploma for the Doctorate has a place in the Appendix.

The College at Princeton, in New Jersey, then possessed—as she still does—the first Orrery constructed by Dr. Rittenhouse; a monument of his genius and abilities, that seemed to give him a just claim to this highest academical honour, appropriate to his character, which the college could confer.

This institution, called Nassau Hall, was founded about the year 1788; but its original charter was enlarged by Governor Belcher, in 1747. The president and trustees of Nassau Hall possessed a power, by their charter, of granting to “the students of the college, or to any others thought worthy of them, all such degrees as are granted in either of the universities, or any other college, in Great Britain.” This privilege, it is believed, was not enjoyed generally—if at all, in any other instance⁽⁹⁴⁾, by the American colleges, before the revolution; as it is supposed they were restricted, prior to that era, to the conferring of degrees in the Arts only. But all the superior seminaries of learning, in the United States, now possess the right of creating Bachelors and Doctors, in Divinity, Law, and Medicine: and it is greatly to be wished, that

(94) Unless, perhaps, in that of King’s College (now Columbia College,) in New-York.

they may always dispense these high academic honours with impartiality and a due discretion.

The college-edifice at Princeton is a stately and durable one, constructed of stone; and it will afford satisfaction to the reader, to be informed, that in this building is deposited the Rittenhouse Orrery. He will derive additional pleasure from learning, that this grand machine has, lately, been repaired in some considerable degree, and at a great expence, by the ingenious Mr. Henry Voight, of the Mint: by whom, that belonging to the University of Pennsylvania, has likewise been put in good order. Neither of these Orreries appeared to have suffered any material injury from the British troops, during the war of the revolution; though it has been generally believed, they did. The libraries, indeed, and some of the apparatus, belonging to both the colleges in which the Orreries are placed, experienced great losses from the presence of an hostile army in their vicinity: but the officers of that army seem to have respected these greater works of human ingenuity.⁽⁹⁵⁾

(95) Dr. Morse observes, that, before the American war, the College of New-Jersey was furnished with a philosophical apparatus, valued at more than thirteen hundred dollars; "which, except the elegant Orrery constructed by Mr. Rittenhouse," says the Doctor, "was almost entirely destroyed by the British army, in the late war; as was also the library, which now" (this was in 1789) "consists of between two and three thousand volumes."

With a view to the obtaining, with greater certainty, information respecting the condition &c. of the Orrery in Princeton

On the first day of January, 1790,⁹⁹ Dr. Rittenhouse was elected one of the Vice-presidents of the

College, the writer of these memoirs addressed a letter on the subject, to his worthy and much respected friend, the Rev. Samuel Stanhope Smith, D. D. then president of that institution :* To that letter the learned president promptly returned the following answer :

Princeton, May 3d, 1812.

" Dear Sir,

" I just redeem a moment, before the closing of the mail, to inform you, that Dr. Rittenhouse's Orrery cost at first 300*L*. Pennsylvania currency. It was his own moderate price, and immediately paid him by Dr. Witherspoon,† on behalf of the College.

" The Orrery was very much injured during the revolutionary war : but has been since partly repaired by a gentleman in your city,‡ who formerly worked with Dr. Rittenhouse, and under his direction, in its fabrication. The injuries which it received were comparatively small, by the British soldiery. A guard was set to protect it : and the officers were said to be contemplating its removal to England ; this, at least, was the general report and opinion. The principal injury was produced by our own militia, when the college was appropriated as a barrack for them. Many of the wheels were seen to be taken off, as handsome curiosities. This, however, was no more than was to be expected from a number of ignorant men, so imperfectly disciplined as, at that time, they were."

"I am, dear Sir,

Your friend and very humble serv't.

SAMUEL S. SMITH."

(96) It was in the autumn of this year that the second (and youngest surviving) daughter of Dr. Rittenhouse was married to the late Nicholas Baker Waters, M. D. of Philadelphia.

* The Rev. Ashbel Green, D. D. of Philadelphia, has since been appointed to the Presidentship of the College at Princeton, on the resignation of Dr. Smith.

† The President of the College.

‡ Mr. Henry Voight.

American Philosophical Society; his colleagues, in this office, being the Rev. William Smith, D. D. and John Ewing, D. D. both of them able and distinguished astronomers.

This appointment he held but one year; in consequence of the death of Dr. Franklin,⁽⁹⁷⁾ on the 17th day of April following.⁽⁹⁸⁾

(97) A very eloquent and interesting Oration on this occasion, being an eulogium on Dr. Franklin, was delivered on the 1st of March, 1791, before the American Philosophical Society and agreeably to their appointment, by the Rev. William Smith, D. D. then one of the vice-presidents of the society; for which the orator received their unanimous thanks.

In a note addressed to the public by Dr. Smith, and prefixed to this eulogium in the first volume of his works, the Doctor acknowledges the assistance derived by him, in its composition, "from the friendly communications of some of his learned colleagues, among the officers of the American Philosophical Society:" viz. David Rittenhouse, Esq. LL.D. President of the Society; Thomas Jefferson, Esq. LL.D. one of the Vice-Presidents; Jonathan Williams, Esq. one of the Secretaries; and Benjamin Rush, M. D. one of the Council. To Dr. Rittenhouse, he makes his acknowledgements, "for sundry papers, which have been digested into the account of Dr. Franklin's *Electrical and Philosophical Discoveries*;" which occupy six or seven pages of the printed eulogium.

Dr. Rittenhouse was well acquainted with the principles of Electricity; at least, so far as they appear to be hitherto understood. It is believed that, pretty early in life, he acquired a knowledge of this branch of science; which he occasionally cultivated afterwards. A letter written by Dr. Franklin to Mr. Landriani, on the utility of electric conductors, will serve to shew, that "our astronomer" (as Franklin styled him) had employed the instrumentality of his "telescope," in observing some

In supplying the vacancy which had thus occurred in the Presidentship of the Society, the members of

of the effects of lightning. This letter, which is dated "Philadelphia, Oct. 14, 1787," is in these words :

"I have received, sir, your excellent dissertation on the utility of electric conductors which you have had the goodness to send me, and I have read it with much pleasure. I beg leave to return you my sincere thanks for it.

"I found, on my return to this country, that the number of conductors was much increased, the utility of them having been demonstrated by several experiments, which shewed their efficacy in preserving buildings from lightning. Among other examples, my own house one day received a severe shock from lightning : the neighbours perceived it, and immediately hastened to give assistance, in case it should be on fire ; but it sustained no damage : they found only the family much frightened by the violence of the explosion.

"Last year, when I was making some addition to the building, it was necessary to take down the conductor : I found, upon examination, that its copper-point, which was nine inches in length and about one third of an inch in diameter in the thickest part, had been almost entirely melted, and very little of it remained fixed to the iron rod. This invention, therefore, has been of some utility to the inventor ; and to this advantage is added, the pleasure of having been useful to others.

"Mr. Rittenhauss,* our astronomer, has informed me, that having observed with his excellent telescope several conductors which were within his view, he perceived that the points of a certain number of them had been in like manner melted. There is no instance where a house furnished with a complete conductor has suffered any considerable damage ; and those even which had none have been very little injured, since conductors have become common in the city."

(98) The body of Dr. Franklin was interred in the cemetery belonging to Christ-Church in Philadelphia, under a plain marble tomb-stone, inscribed with only his name, the time of his

* So written by Dr. Franklin.

that body could not hesitate in selecting, for that honourable station, a suitable successor to their late venerable patron and chief: the eyes of all were immediately directed towards Dr. Rittenhouse. He was accordingly elected to be President, at the stated annual meeting of the Society for the purpose of choosing their officers, held in January, 1791. On being notified of this appointment, he addressed the following letter to Mr. Patterson, one of the secretaries of the Society.

decease, and his age. But the following epitaph on himself was written by him, many years before his death. As it contains a pretty allusion, typically expressed, to his belief in the Immortality of the Soul, it may not be deemed superfluous to add, on the present occasion, the testimony of this philosopher in concurrence with Rittenhouse's, on that subject. If the doctrine had needed any further verification than before established it, the suffrages of two such men as FRANKLIN and RITTENHOUSE could scarcely fail to remove the doubts of the most sceptical. This epitaph is copied from *Stuber's Continuation of the Life of Franklin*.

THE BODY
of

BENJAMIN FRANKLIN, *Printer*,
(Like the Cover of an old Book,

It's Contents torn out,
And stript of its Lettering and Gilding,)

Lies here, food for worms;

Yet the Work itself shall not be lost,

For it will (as he believed) appear once more,

In a new

And more beautiful Edition,

Corrected and amended

by

THE AUTHOR.

X X

"Philadelphia, Jan. 22 1791.

"Sir,

"I am extremely sensible of the honour the members of the Philosophical Society have done me, by electing me their President, in the room of that very worthy patron of the Society, the late Doctor Franklin.

"They have, by this act of theirs, laid an additional obligation on me to promote the interests of the institution, by the best means in my power, to which I shall ever be attentive; though my ill state of health will frequently deny me the pleasure of attending the stated meetings.

"I send you, herewith, two letters which you will please to communicate to the society.—I am, Sir, your very humble servant.

"DAVID RITTENHOUSE."

"In this elevated situation, the highest that Philosophy can confer in our country," says his learned and eloquent Eulogist,⁽⁹⁹⁾ "his conduct was marked by its usual line of propriety and dignity."—"Never," continues his Eulogist, "did the artificial pomp of station command half the respect, which followed his

(99) Benjamin Rush, M. D.

unassuming manners in the public duties of this office. You will," says he, "often recollect, Gentlemen, with a mixture of pleasure and pain, the delightful evenings you passed in the Society, every time he presided in your meetings. They were uniformly characterized by ardour in the pursuits of science, urbanity, and brotherly kindness."

About the time of Dr. Rittenhouse's elevation to the Presidency of the Philosophical Society, and indeed pretty generally afterwards, the delicate state of his health confined him much to his house and his observatory. On a dry day, he would, occasionally, walk a little abroad; in the proper seasons, he would now and then recreate himself in a pretty little flower-garden adjoining his house, which Mrs. Rittenhouse took pleasure in decorating. His evenings were uniformly passed at home; except at the times of the stated meetings of the Philosophical Society, when he usually attended, if the weather permitted.

Besides a few of his most intimate friends, who were in the habit of visiting him pretty often towards the close of the day⁽¹⁰⁰⁾, many strangers of distinction,

(100) Of those gentlemen who were among Dr. Rittenhouse's more particular acquaintances, and with whom he maintained the closest friendship, few, if any, visited him more frequently than the late Francis Hopkinson, Esq.

Mr. Hopkinson was a man of genius, taste and learning. He possessed an exuberance of refined and genuine wit, rarely to be

and persons who had no particular claims upon him on the score of friendship, made him occasional visits at other times : but in such portions of his time as he could retrench from these avocations, he was much employed in reading ; and the books he read comprehended works of literature, taste, and science. He blended the *utile cum dulci*, in the choice of his sub-

met with ; and his vein for satire, which was always applied to useful ends, was almost unrivalled. His knowledge of music was correct and extensive, both in the theory and practice of that art ; and he had also a critical acquaintance with painting, as well as a good judgment, in relation to the fine arts in general. These qualifications and attainments, united with a vivacious temper, a knowledge of mankind, and a love of virtue, rendered him a pleasing companion : but the more solid acquirements in literature and science, of which, also, he possessed a very considerable share, made his society not less interesting than agreeable. No one set an higher value on Dr. Rittenhouse's talents and virtues, than this gentleman ; their esteem was mutual ; and a constant and intimate friendship long subsisted between them.

Mr. Hopkinson held an appointment in the Loan-office of Pennsylvania, for some years. He afterwards succeeded George Ross, Esq. in the office of Judge of the Admiralty, for that state. In this station he continued until the year 1790 ; when President Washington. by whom he had the honour to be much esteemed, conferred on him the place of Judge of the District Court of the United States, for Pennsylvania : which important office he held during the remainder of his life. A collection of Judge Hopkinson's writings, on various subjects, was made after his death, and published in the year 1792, in three octavo volumes ; constituting a curious and entertaining miscellaneous work. He died on the 8th of May, 1791, in the fifty-third year of his age, and somewhat more than five years before his venerated friend, Rittenhouse.

Mr. Hopkinson was one of the executors of Dr. Franklin's Will ; but he survived the Doctor little more than a year.

jects; and while he devoted some of what might be called his leisure hours, such as were abstracted from his more appropriate pursuits, to works of amusement, he did not neglect studies of a more serious and important nature. He was at no loss for books: independently of his own collection, he had ready access to two valuable and extensive public libraries⁽¹⁰¹⁾; those of several literary gentlemen were open to him; and some of his friends occasionally supplied him with new publications. The following note addressed to him by Mr. Jefferson, in the beginning of the year 1791, will shew that Dr. Rittenhouse then devoted some attention to chemistry, and that he continued to read works of natural science, in French, as well as in his own language.

“TH. JEFFERSON sends to Mr. Rittenhouse Bishop Watson’s essay on the subjects of chemistry, which is too philosophical not to merit a half an hour of his time, which is all it will occupy. He returns him Mr. Barton’s papers⁽¹⁰²⁾, which he has perused with great pleasure; and he is glad to find the subject has

(101) Belonging to the Library Company of Philadelphia, and to the American Philosophical Society.

(102) The papers, referred to by Mr. Jefferson, were “Observations on the probabilities of the Duration of Human Life, and the progress of Population, in the United States of America;” addressed, in the form of a Letter, to Dr. Rittenhouse, Presid. of the Am. Philos. Society, and afterwards published in the third volume of the Society’s Transactions.

been taken up by so good a hand : he has certainly done all which the scantiness of his materials would admit. If Mr. Rittenhouse has done with the last number of the *Journal de Physique*, sent him by Th. J. he will be glad to receive it, in order to forward it on to Mr. Randolph : if not done with, there is no hurry.

“Monday morning.”

The relation in which Dr. Rittenhouse now stood to the American Philosophical Society, of which he had attained to the honour of being the President, renders it proper that some account should be given, in this place, of an institution heretofore distinguished by its Transactions. The following are the leading features in its history.

This Society was instituted on the 2d day of January, 1769, by an union of two literary societies that had subsisted some time previously, in Philadelphia. In the same year this united body petitioned the general assembly of the province to grant them the privilege of erecting a building, suitable for their accommodation, on some part of the State-House square. But the Library Company of Philadelphia, also a very useful and respectable institution and a much older corporation, having about the same time made a similar application to the legislature, in their own behalf,

the prayer of neither was then granted. The latter have, long since, erected for their accommodation a large, commodious and elegant structure⁽¹⁰³⁾, on a lot of ground purchased by them for the purpose, in the immediate vicinity of the public square originally contemplated for its site.

A second petition was presented to the general assembly by the Philosophical Society, for the same purpose, soon afterwards; though without success. But, finally, in pursuance of another application to the state legislature by the Society, for the same object, a law was enacted on the 28th of March, 1785; by which a lot of ground (being part of the State-House Square) was granted to them, for the purpose of erecting thereon a Hall, Library, &c. "for their proper accommodation."

The ground appropriated by the legislature, for this purpose, contains seventy feet in front on (Delaware) Fifth-Street, (and nearly opposite the Hall of the Philadelphia Library-Company,) and fifty feet in depth; on which the Society erected, between the years 1787 and 1791, a neat, convenient, and spacious edifice: it was completed under the direction and superintendence of Samuel Vaughan, Esq. for-

(103) In a niche, over the entrance into the edifice, is placed a Statue, in white marble, of Dr. Franklin; presented to the Library Company by the late William Bingham, Esq. of Philadelphia.

merly a vice-president of the Society; and by means of this gentleman's disinterested exertions, principally, somewhat more than \$8500 were obtained from about one hundred and fifty contributors, towards defraying the expense of the building. Dr. Franklin gave at sundry times, towards this object, nearly \$540 in the whole amount.⁽¹⁰⁴⁾

The act of assembly of 1785 having, however, restricted the corporation of this Society, not only from selling or transferring, but from leasing, any part of the ground thus granted to them, or of the erections to be made on it, a supplement to that act was obtained, on the 17th of March, in the following year; authorizing the Society to let out any part of their Building, for such purposes as should have an affinity to the design of their institution; but restricting the profits arising from any such lease to the uses for which the Society was originally instituted. The cellars and some of the apartments in the house, have been leased accordingly; and the profits arising from these leases constitute a considerable part of the Society's funds, which are of very moderate extent. The resident members pay to the Treasurer a small annual assessment, fixed by a by-law of the Society: these payments, in addition to occasional donations in mo-

(104) The Doctor also made, at different times, valuable donations to the Society, in Books and some other articles.

ney, made by members and others,⁽¹⁰⁵⁾ form the residue of the funds of the Society; besides which, they receive from time to time valuable presents, in books, astronomical and other instruments, &c. Their library, philosophical apparatus, and collections of various kinds, are now respectable.

The objects of this institution are readily comprehended, from its name; the style of the corporation being—"The American Philosophical Society held at Philadelphia, for promoting Useful Knowledge:" And with this view, in its formation, the fundamental laws (passed on the 3d day of February, 1769,) direct, that "The members of the Society shall be classed into one or more of the following committees :

1. Geography, Mathematics, Natural Philosophy and Astronomy.
2. Medicine and Anatomy.
3. Natural History and Chemistry.
4. Trade and Commerce.
5. Mechanics and Architecture.
6. Husbandry and American Improvements."

'The same original laws and regulations of the Society indicate the style of the several officers of the in-

(105) It is due to the liberality of the general assembly of 1782-3, to notice in this place, that on the 16th of February, 1783, that legislative body of Pennsylvania made a grant to the American Philosophical Society, of four hundred dollars.

stitution, and prescribe the duties of their respective stations : they likewise direct the manner in which the general economy of the Society shall be managed, and their proceedings, in the more appropriate business of their institution, arranged and conducted. "These Rules," say the Society (in an Advertisement prefixed to the first volume of their Transactions,) "were adopted from the Rules of that illustrious Body, the Royal Society, of London; whose example the American Philosophical Society think it their honour to follow, in their endeavours for enlarging the sphere of knowledge and useful arts."

The Officers of the Philosophical Society are—a patron, who is the governor of the state for the time being—a president—three vice-presidents—a treasurer—four secretaries, and three curators,—together with twelve counsellors; which last board of officers was created by an act of the legislature, in the year 1780, and the same law designates the duties of their appointment.

The number of members of this Society is not limited : it consisted of three hundred, forty years ago ; and, probably, now amounts to about four hundred and fifty. Of this number, however, a large proportion is made up of foreigners ; many of whom are eminent personages, and men of the most distinguished abilities in various departments of science, in different parts of the world.

The Proceedings, hitherto, of this very respectable association of literary and scientific characters, have been published in six⁽¹⁰⁶⁾ quarto volumes, denominated the "Transactions" of the Society : Besides which, several learned and ingenious Orations—including two or three of much eloquence, under the title of Eulogiums—have been delivered before the Society and by their appointment, by members of their body.

These outlines will serve to furnish the reader with some ideas of the nature, condition, and character of an institution, which has, in many respects, reflected honour on the country to which it belongs. Its usefulness,⁽¹⁰⁷⁾ it is earnestly to be wished, will not be suf-

(106) Part the 1st of the 6th volume was published in the year 1804, and a continuation of that volume, in 1809.

(107) At the death of Hevelius, as Lalande remarks, Europe abounded with men of science, whose various nations disputed the glory of important discoveries, and of perfecting those which had been already made. The Academy of Sciences at Paris and the Royal Society of London produced, above all, as the same learned writer further observes, that revolution (as he is pleased to term it,) by the great number of illustrious men and celebrated astronomers, which they gave to Europe. The Royal Society was instituted in the year 1660; and it is deserving of notice, that this was the period at which the English nation was on the eve of a restoration of their legitimate and orderly government, after the boisterous and unhappy times of Cromwell and his pretended Commonwealth: The Academy of Sciences was established in 1666; not long after France had likewise been distracted by domestic factions; but, when the great Colbert had restored the finances of the state, and not only invigorated but improved every department of that powerful monarchy. La-

ferred to diminish, by any declension of that noble ardour in cultivating, that public spirit in promoting, learning and science, which, while they adorn the names of individuals, contribute to the glory of a nation. Let a hope be still cherished, that notwithstanding the tumult, the folly, and the distractions, which at the present day pervade a large portion of the civilized world, the period is not remote, when tranquillity, good sense and order, shall resume their blest dominion over the conduct of the too many now infatuated nations of the earth.—Let a belief be yet encouraged, that under the guidance of a benign Providence, not only the rising generation will be found zealous to emulate the fair fame of a FRANKLIN and a RITTENHOUSE; but even, that good and rational men in our own time, and among ourselves, will continue to cultivate the arts of peace, and to promote those objects of literature and science, which, at the same time they meliorate the heart and elevate the mind, contribute to the happiness of the individual and the general welfare of mankind.

Dr. Rittenhouse's attachment to the interests of the institution of which he had been thus recently elected President, was amply manifested soon after. In the month of November, of the same year, he presented to the Society, the sum of 308*l*. (equivalent to

lande designates this period, as an era distinguished for the renewal of astronomy, by the establishment of Academies. Such are the proofs of the usefulness of institutions of this nature.

881½ dollars,) for the purpose of discharging a debt due by their corporation to the estate of the late Francis Hopkinson, Esq. the treasurer, then deceased. This liberal donation was thankfully received; and the acknowledgments of their grateful sense of it were made to the donor, by the following address,—expressive as well of their feelings on the occasion, as of the high opinion they entertained of his merits and character.

“To DAVID RITTENHOUSE, Esq. LL.D. President of the American Philosophical Society, held at Philadelphia, for promoting Useful Knowledge.

“Sir,

“The American Philosophical Society embrace the present occasion of a meeting for stated annual business, to acknowledge the receipt of your letter, dated Nov. 15th, addressed to their treasurer; in which you are pleased to inform him, that you have paid the 308½. due to the late Judge Hopkinson, and will lay the bond and mortgage before the Society; expressing your hopes, that this benefaction, on your part, may “encourage the Society to exert themselves to get rid of some other heavy debts and incumbrances.”

“This renewed instance of your liberality joined to the consideration of the illustrious part which you have taken in their labours, for many years past, has

made such an impression upon them, that they are at a loss in what manner they can best express their gratitude, or their respect and veneration for your name.

“ At any time, and in any country, such a “brilliant present” would indicate a mind that can feel the inseparable connection between Learning and Human Felicity : But in the present state of our finances, it is a most important benefaction ; and a noble specimen of Literary Patronage in a young empire, where many other improvements must share with the Arts and Sciences, in the public attention and bounty.

“ We are sensible of the necessity of extinguishing the other heavy debts of the Society, with all possible speed, and have appointed a proper committee for that purpose.

“ Signed in behalf, and by order, of the Society, at a meeting held the 16th day of December, 1791.

“ JOHN EWING, WILLIAM SMITH, TH. JEFFERSON,
Vice Presidents.

“ JAMES HUTCHINSON, JONATHAN WILLIAMS, SAMUEL MAGAW, *Secretaries.*”

To which address, Dr. Rittenhouse returned this answer.

“ Gentlemen,

“ The satisfaction I feel, in contributing something towards promoting Science, the interests whereof are,

I am persuaded, inseparable from those of humanity, is greatly increased by your very polite approbation.

“My sincerest wishes are, that you may ever merit public encouragement, and enjoy the patronage of the generous and the good.”

In the spring succeeding Dr. Rittenhouse's election to the Presidency of the Philosophical Society, his name was included, jointly with those of Thomas Willing, Esq. and the late Samuel Howell, Esq. in a commission to receive subscriptions, in Pennsylvania, to the Bank of the United States. This appointment was made by President Washington, on the 26th of March, 1791.

Soon after, he was commissioned by Governor Mifflin to be one of three joint “Agents of Information,” relating to the business of opening and improving certain roads, rivers and navigable waters, in Pennsylvania. His colleagues in this commission were the Rev. Dr. William Smith and William Findley, Esq. and this board of commissioners, whose appointment bears date the 10th of May, 1791, was erected in pursuance of an act of assembly, passed the 13th of April, preceding. These gentlemen, it appears, proceeded on that service; for, about two months after their appointment, monies were advanced to them, towards defraying the expences to be incurred in executing the duties of their commission.

These duties, it is believed, were in some way connected with an investigation of the most practicable route for a turnpike-road between Philadelphia and Lancaster. A company, which had been formed some time before, for the purpose of constructing such a road, were incorporated by the governor of the state, by virtue of a law passed the 9th of April, 1792. Dr. Rittenhouse was a member of that company, and he actually superintended the surveyors, who were employed in tracing one of the then contemplated routes : Dr. Ewing was likewise engaged in the same service. Neither of those gentlemen held any appointment for such purposes, from the managers of the turnpike-company, nor received any compensation from them, for their services : it is therefore presumed, that Dr. Rittenhouse officiated under the commission last mentioned ; and perhaps Dr. Ewing acted, also, under a similar commission.⁽¹⁰⁸⁾ The former, however, was

(108) Since the above was written, more satisfactory information has been obtained on the subject. The agency of information, to which Dr. Rittenhouse was appointed (together with the Rev. Dr. Smith and Mr. Findley,) in May, 1791, was unconnected with the appointment respecting the turnpike road. It appears, that on the 10th of October, 1791, David Rittenhouse, Esq. the Rev. Dr. John Ewing, and Mr. John Nancarrow, were appointed by Governor Mifflin, Commissioners to view and mark out a road, from the middle ferry on Schuylkill to the borough of Lancaster, by courses and distances, as near to a straight line as the nature of the ground and other circumstances would admit ; and also to view and lay out, in a general plan, the great road at that time leading from the city of Philadelphia to the same borough, (and now called the old road :) with topographical observations thereon, having reference to the practicability and

himself one of the board of managers; in which capacity he acted as a member of several committees, particularly in 1792: but at the end of that year, he declined to continue any longer a manager.⁽¹⁰⁹⁾

It has been before noticed, that, on the elevation of the College of Philadelphia to the grade of an University, by an act of assembly passed in November, 1779, Dr. Rittenhouse was one of the trustees of the new institution, created by that law. On the 30th of September, 1791, almost twelve years afterwards, a compromise was effected between the respective advocates of the old and the new institution; a law of the state being then passed, "to unite the University of the state of Pennsylvania, and the Col-

comparative circumstances necessary to making turnpikes on the then existing and proposed roads; in which, expense and materials were to be attended to; together with the plans of the surveys, in profile, of the said road or roads: agreeably to a resolution of the general assembly, passed on the 30th of September, in the same year. Under commissions thus designating their duties, these gentlemen, assisted by surveyors and the necessary attendants, proceeded on this service, and established that great and important public highway, known by the name of the Philadelphia and Lancaster Turnpike Road: their compensation for this service, was consequently drawn from the treasury of Pennsylvania.

The author was favoured with this information by John Hall, Esq. who acted as one of the surveyors on the occasion.

(109) These particulars, respecting Dr. Rittenhouse's connection with the Philadelphia and Lancaster Turnpike-Company, were obligingly furnished to the Memorialist by Mr. William Govett, secretary to the board of managers of that company.

lege, Academy and Charitable School of Philadelphia, &c'' By this act, the then existing trustees of each institution were to elect twelve trustees; and the twenty-four persons who should be thus chosen, together with the governor of the state for the time being, as president of the board, were to be the trustees of this united seminary, under the denomination of "The Trustees of the University of Pennsylvania."

On this occasion, Dr. Rittenhouse was again chosen a member of the corporation, on the part of the University, the election having been made the 3d of November, 1791; at which time, Bishop White was president of the board of the College trustees, and Dr. M'Kean, late governor of Pennsylvania, of that of the University. By an act of assembly, passed the 6th of March, 1789, so much of the act erecting the University, as affected the charters, franchises and estates of the College of Philadelphia, had been repealed, and the powers of the former trustees revived: but by the act of 1791, all the estates of the two institutions were vested in this one, composed of both.

The union of the separate interests of those seminaries, it may be reasonably expected, will eventually prove a fortunate circumstance: because, by its extinguishing the jealousies and rivalry⁽¹¹⁰⁾ that here-

(110) By the legislative act of the 27th of November, 1779, the charter granted to the Academy and Charitable School of

tofore subsisted between the friends of each, which must, too, have continued to operate, had they remained separate; and, by consolidating their estates and pecuniary resources into one fund, greatly increasing the sphere of their usefulness, beyond the ratio in which they could have been enjoyed separately; the important interests of literature might be expected to be proportionably advanced. A doubt can not be entertained, that this was an object very desirable by the benevolent Rittenhouse, as well as by the trustees, generally, of these conjoint institutions.⁽¹¹¹⁾

Philadelphia, by the Proprietaries, on the 30th of July, 1753, together with the one granted to the College on the 14th of May, 1755, were declared void, and David Rittenhouse, Esq. was one of the twenty-five trustees of the University, then appointed. Twelve of these twenty-five newly-appointed trustees, were such *ex officio*. Dr. Franklin, who was one of them, never qualified under this act; and some of the others afterwards withdrew.

By the law of the 30th of September, 1791, the old College and the new University were incorporated: twelve trustees were to be appointed by each of these institutions, and reported to the governor before the 1st of December succeeding, which was accordingly done; and thus the union of the two institutions was happily completed.

(111) Between the years 1762 and 1774, there were collected for the use of the College, chiefly by the agency and zealous exertions of the Provost, between fifty and sixty thousand dollars; the much greater part of which amount was obtained from contributors in Great-Britain and Ireland.

It is not precisely known to the writer, what is the present condition of the University of Pennsylvania, with which the original College of Philadelphia and its appendages are incorporated; but it is believed to be prosperous: its medical department is, certainly, in a most flourishing state.

It has been already noticed, that the first academic honour conferred on Dr. Rittenhouse, was obtained from the College of Philadelphia : he might therefore consider it as being his *Alma Mater* ; and his attachment to that seminary must have been strengthened, by the circumstance of one of his (only two) Orreries having been acquired by it, and its being deposited in the college-edifice. But, besides these considerations,

The persons who may be considered as the Founders of the College, when the original institution was incorporated by the name of "The Academy and Charitable School of Philadelphia," were Benjamin Franklin, James Logan, Thomas Lawrence, William Allen, John Inglis, Tench Francis, William Masters, Lloyd Zachary, Samuel McCall, junior, Joseph Turner, Thomas Leech, William Shippen, Robert Strettel, Philip Syng, Charles Willing, Phineas Bond, Richard Peters, Abraham Taylor, Thomas Bond, Thomas Hopkinson, William Plumsted, Joshua Maddox, Thomas White and William Coleman. The names of these respectable men, (the meritorious promoters of that institution which fostered the genius of a Rittenhouse, and with which his name and talents were associated,) were deemed deserving of record, as early patrons of learning in Pennsylvania. Of this College, the *Alma Mater* of the memorialist, he trusts it will not be thought presumptuous to speak in the language, and with the grateful feelings, of one of her Sons,* in an early period of his life :

"Blest Institution ! Nurse of Liberty !

My heart, my grateful heart shall burn for thee.

No common pride I boast, no common joy,

That thy instructions did my youth employ :

Tho' not the first, among thy sons, I prove ;

Yet well I feel, I'm not the last in love.

O may'st thou still in wealth and pow'r encrease,

And may thy sacred influence never cease !"

* The late Francis Hopkinson, Esq. See his Poem entitled, *Science* ; inscribed to the Trustees, Provost, Vice-Provost, and Professors of the College of Philadelphia, A. D. 1762.

he officiated, for some time, as Vice-provost and a professor in the institution, after it became an University. To the first of these stations, he was elected on the 8th of February, 1780; having been unanimously appointed professor of astronomy, the 16th of December preceding: a salary of one hundred pounds per annum was annexed to the vice-provostship, and three hundred pounds per annum to the professor's chair. These places Dr. Rittenhouse resigned, the 18th of April 1782.

Thus attached to, and connected with, this very respectable seminary of learning, as Dr. Rittenhouse was, the following occurrences in the history of its origin and advancement, will not be deemed uninteresting, by the reader.

The Academy and Charitable School, of Philadelphia, originated in the year 1749. This institution, which was opened in that year, was projected by a few private gentlemen; and many others, of the first respectability, gave their countenance to it, as soon as it became known: some of them were, on its first establishment, appointed trustees of the infant seminary.

The persons on whom the charge of arranging and digesting the preparatory measures for this important undertaking, were Thomas Hopkinson,⁽¹¹²⁾ Tench

(112) A lawyer of eminence.

Francis,⁽¹¹³⁾ Richard Peters and Benjamin Franklin, Esquires.⁽¹¹⁴⁾ The last mentioned of these distinguished and patriotic gentleman draughted and published the original proposals; and on the opening of the Academy, another of them, Mr. Peters, (afterwards D. D. and rector of Christ's-Church and St. Peter's in Philadelphia,) who long officiated as provincial secretary, preached an appropriate sermon—on the 7th of January, 1751—from these words (St. John, viii. 32.) “*And ye shall know the truth, and the truth shall make you free.*”—“This reverend and worthy gentleman” said Dr. Smith, in his account of this institution, first published among his works in the year 1762 “(who, amid all the labours of his public station, as well as the private labours in which his benevolence continually engaged him, has still made it his care to devote some part of his time to classical learning, and the study of divinity, to which he was

(113) Then attorney-general of Pennsylvania.

(114) In selecting the twenty-four trustees for the proposed Academy, as well as in the formation of his plan, Dr. Franklin consulted, besides the three gentlemen named with him, in the text, Dr. Phineas Bond, a physician of eminence in Philadelphia and a worthy character. The trustees, whose names were inserted in the contributions, and which were subscribed on the 13th of Nov. 1749, were among the most respectable citizens of Philadelphia. The plan of the then projected Academy was adapted to “the state of an infant country;” Dr. Franklin having considered it as only “a foundation, for posterity to erect (thereon) a seminary of learning more extensive, and suitable to future circumstances.”

originally bred,) took occasion, from these words of our blessed Saviour, to shew the intimate connexion between truth and freedom,—between knowledge of every kind, and the preservation of civil and religious liberty.”

The Rev. William Smith, M. A. (afterwards D. D.) was inducted, on the 25th of May, 1754, as head of this seminary, under the title of Provost, with the professorship of natural philosophy⁽¹¹⁵⁾ annexed to that station

On the 14th of May, 1755, an additional charter was granted by the Proprietaries to this seminary, by which a College was engrafted upon the original Academy: a joint government was agreed on for both, under the style of “The College, Academy and Charitable School, of Philadelphia, in Pennsylvania;” and this enlarged institution became invested with a power of conferring degrees, and appointing professors in the various branches of the arts and sciences.

The first commencement, in this College and Academy, was held the 17th of May, 1757;⁽¹¹⁶⁾ on which

(115) He was, afterwards, also professor of astronomy and rhetoric; and he gave lectures in these branches, in addition to natural philosophy.

(116) The following is an extract from the Salutatory Oration delivered by Mr. Paul Jackson,* at the first Commencement

* Mr. Jackson was professor of languages and master of the Latin school, in the college, until the spring of the year 1758; when he accepted of a captaincy in the provincial service, in the expedition under general Forbes, against the French and their Indian allies. On the resignation of his professorship, Mr. Jackson was succeeded by Mr. Beveridge.

occasion, an excellent charge was delivered to the graduates, by the Provost. One passage in that charge is so patriotic and impressive, as to merit attention at all times, in a country that boasts of a free constitution of government; its introduction at this time, and on the present occasion, cannot be considered improper: it is the following animated and eloquent exhortation to active patriotism, in times of misrule, popular delusion, and public danger:—

“Should your Country call, or should you perceive the restless tools of faction at work in their dark cabals, and ‘stealing upon the secure hour of Liberty;’ should you see the corruptors, or the corrupted, imposing upon the public with specious names,—un-

held in the College of Philadelphia; when a Master’s degree was conferred on that gentleman, and on him only.

After making his salutations of respect to the professors generally, the orator thus addressed the Rev. Mr. (afterwards Dr.) Smith, the Provost:

“Præcipué, Te, collegii et academix hujus Præfecte venerande! summâ benevolentia a nobis observari par est. Tu gressus nostros, dum subtilioris sapientix recessus curiosè indagamus, direxisti. Tu nobis, mansuetioribus musis operam impendentibus, orationis simplicis ac perspicuæ regulas, venusta ornamenta ac veneres accuratè eleganterque explicuisti. Tu, quid sit magnificum tum in verbis, tum in sententiis, tum in figuris, edocuisti, omnesque sublimitatis fontes, ipsius Longini majestatem et acumen feliciter æmulatus, auditoribus tuis admirantibus retexisti. Qui vult fieri disertus, scripta tua, tanquam præceptorum exempla luculenta, sæpius versato; animum intendat ad argumenta multifaria, quæ tam variè, tam numerosè, tam abundanter, tam illuminatè, tum rebus tum verbis tractasti.”

dermining the civil and religious principles of their country, and gradually paving the way to certain Slavery, by spreading destructive notions of Government;—then, Oh! then, be nobly roused! Be all eye, and ear, and heart, and voice, and hand, in a cause so glorious! Cry aloud, and spare not,—fearless of danger, regardless of opposition, and little solicitous about the frowns of power, or the machinations of villany. Let the world know, that Liberty is your unconquerable delight; and that you are sworn foes to every species of bondage, either of body or of mind. These are subjects for which you need not be ashamed to sacrifice your ease and every other private advantage. For, certainly, if there be aught upon earth suited to the native greatness of the human mind, and worthy of contention,—it must be to assert the cause of Religion, and to support the fundamental rights and liberties of mankind, and to strive for the constitution of your country,—and a government of laws, not of Men.”

In the year 1765, the original plan of this institution was greatly enlarged, by the addition of the Medical School;⁽¹¹⁷⁾ with the appointment of Professors,⁽¹¹⁸⁾

(117) Dr. William Shippen, the younger, who first filled the anatomical chair in the College of Philadelphia, (afterwards, the University of Pennsylvania,) and which he continued to occupy for almost forty-three years with great respectability, may be justly considered as the founder of the medical department of that institution. The establishment of a medical school in his native city, had long been contemplated by this distinguished

for reading lectures in anatomy, botany, chemistry, the materia medica, the theory and practice of physick,

lecturer, as a most desirable object: but, in the execution of such a plan, serious difficulties were to be encountered at the commencement. In the language of his anonymous eulogist,* "the enterprize, arduous in itself, was rendered abundantly more so, in consideration of its novelty: for, as yet, the voice of a public lecturer in medicine had never been heard in the western world. In order, therefore, to test the practicability of the measure, and to pave the way for a more regular and extensive establishment, he determined to embark in the undertaking himself, by delivering, in a private capacity, a course of lectures on anatomy and surgery: this he did in the winter of 1762-3, being the first winter after his return from his studies and travels in Europe."

Dr. Shippen's success, as a private lecturer, demonstrated the expediency of engrafting a medical school on the College; and, in consequence, he was unanimously elected the professor of anatomy and surgery, on the 17th of September, 1765. This able teacher held that chair until his death,† which occurred the 11th of July, 1808, in the seventy-fifth year of his age.

(118) William Shippen, jun. M. D. just mentioned, was the professor of anatomy; Adam Kuhn, M. D. a distinguished pupil of the celebrated Linnæus, was professor of botany, united with the materia medica; Benjamin Rush, M. D. a learned and able professor of the theory and practice of physick, then held the chemical chair; and Dr. Thomas Bond, an ingenious and eminent physician, gave clyrical lectures in the Pennsylvania Hospital. In the year 1789, the trustees of the College of Philadelphia instituted a professorship of natural his-

* Said to be Dr. Caldwell, of Philadelphia. See the *Port Folio*.

† Casper Wister, M. D. Professor of Anatomy and Surgery in the University of Pennsylvania, was, for some years before the death of Dr. Shippen, his adjunct professor in the same chair; to which station, this eminent teacher in those branches of medicine was appointed by the trustees of the university, at the request of his late colleague.

and also for delivering clyrical lectures in the Pennsylvania Hospital. Since that period, and after the

tory and botany; which was then conferred on Benjamin Smith Barton, M. D. Dr. Kuhn had formerly delivered several courses of lectures on botany, in the College of Philadelphia; but natural history had never before been taught there. On the union of the College with the University, in the year 1791, Dr. Barton's former appointment was confirmed by the trustees of the united institution; and in the year 1796, he was further appointed by them to the professorship of materia medica; that chair having been then vacated by the resignation of the late professor of that branch of medical science.

The other chairs, in the Medical Department of the University, are filled as follows; viz. that of Anatomy, by Casper Wister, M. D.—of the Theory and Practice of Physick, by Benjamin Rush, M. D.*—of Chemistry, by John Redman Coxe, M. D.—of Materia Medica, Botany and Natural History, by Benjamin Smith Barton, M. D.—of Surgery, by Philip Syng Physick, M. D. and John S. Dorsey, M. D.—and of Midwifery, by Thomas Chalkley James, M. D.

Among these collegiate-chairs in medicine, appertaining to the University of Pennsylvania, the only one which appears to be deficient in a suitable appendage to its institution—and this, too, such an appendage as may be considered almost indispensably necessary to it—is the Professorship of Botany. To this chair, a *Botanical Garden* ought to be appurtenant: and accordingly we find, that this requisite for rendering a Botanical Professorship complete, in most Universities, is the establishment of such a Garden, for the use of the Teacher and his Pupils.

The importance that is attached to institutions of this kind, in foreign seminaries of learning, will be perceived from the following sketches of those in three of the most celebrated universities of Europe.

The Botanical Garden (called the “Physick Garden”) of the university of Oxford, contains five acres of ground. It is surrounded by a noble wall, with portals in the rustic style, at proper distances. The passage to the grand entrance is through a small court: this principal portal is of the Doric order, orna-

* Since deceased.

erection of the whole of the College-establishment into an University, the Medical department has been still

mented with rustic work, and adorned with a bust of Henry Danvers, Earl of Danby, the founder; besides statues of the kings Charles I. and II.

The ground is divided into four quarters. On each side of the entrance, is a neat and convenient green-house, stocked with a great variety of exotics. The quarters are filled with indigenous plants, properly classed; and without the walls is an admirable hot-house, filled with various plants, the production of warm climates.

These fine and spacious gardens were instituted by Lord Danby, so early as the year 1632; and this nobleman having supplied them with the necessary plants, for the use of the students of Botany in the university, endowed the establishment with an annual revenue, for its support. The Gardens were afterwards much improved by Dr. Sherrard, who assigned a fund of 3000*l.* sterling, for the maintenance of a professor of Botany. Over the grand entrance into the Gardens is this inscription: "*Gloria Dei Optimi, maximi honori Caroli I. Regis, in usum Academicæ et Reipublicæ, Henricus Comes Danby, anno 1632.*"

The Botanic Garden, at Cambridge, consists of nearly five acres, well watered. The ground, with a large house for the use of the governors and officers of the Garden, was purchased at the expense of about 1600*l.* sterling, by Dr. Richard Walker.

An handsome green-house, one hundred feet in length, and having an hot-house (or, what is called a stove,) appurtenant to it, were erected by subscription. These are furnished with an extensive variety of curious exotics: the plants are all arranged according to the Linnean system, and a catalogue of them is printed.

These Gardens are under the government of the chancellor or vice-chancellor of the university, the heads of three of the colleges, and the regius professor of physick; and they are superintended by a lecturer or reader, and a curator.

There is, besides, a Professorship of Botany, in this university; as there is also at Oxford.

The Botanical Garden belonging to the university of Edinburgh, is about a mile from the city. It consists of a great

further extended, by the creation of other Professorships in the Schools of Medicine, and filling these

variety of plants, exotic and indigenous. The Professor is botanist to the king, and receives an annual salary of 120*l.* sterling, for the support of the Garden. A monument to the memory of Linnæus was erected here, by the late Dr. Hope, who first planted the Garden and brought it to perfection.

The Garden of Plants, at Paris, now termed the Museum of Natural History, comprises a space of many acres. It dates its origin as far back as the year 1640, during the reign of Louis XIII. In 1665, it bore the name of *Hortus Regius*, and exhibited a catalogue of four thousand plants. From that period, it made but slow progress, until Louis XV. placed it under the direction of the Count de Buffon, the celebrated naturalist; to whose anxious care and indefatigable exertions, it owes its present extent and magnificence: it is now under the patronage of the government.

But this institution comprehends, in addition to the Botanical Garden, an extensive chemical laboratory, a cabinet of comparative anatomy, a cabinet of preparations in anatomy and natural history, a large library, a museum of natural history, and a menagerie well stocked. Besides the lectures delivered in the Amphitheatre, erected in these Gardens, the Professors of Botany give their peripatetic lessons, in good weather, to a numerous train of disciples.

"When I have been seated at noon, on a fine day, in the month of August, or in the commencement of May, under one of the majestic ash of the Garden of Plants, with this Elysian scene before me, in the midst of a most profound silence, and of a solitude interrupted only by the occasional appearance of the Professor of Botany and his pupils, I have almost fancied myself," says the writer of *Letters on France and England*—(see Am. Rev. No. ii.) "among the groves of the Athenian Academy, and could imagine that I heard the lessons of the "divine" Plato. Here, as well as in the spacious and noble works and gardens of Oxford, which are so admirably calculated for the exercises both of the mind and body, the fancy takes wing, and readily transports the student of antiquity to those venerable seats of knowledge, where the sublime Philosophy of the Greeks was

new chairs—as well as those originally instituted—with men of distinguished learning and abilities : By

taught, and the masters of human reason displayed their incomparable eloquence :”—

“the green retreats
Of Academus,* and the thymy vale,
Where, oft enchanted with Socratic sounds,
Ilyssus,† pure, devolv'd his tuneful stream
In gentle murmur.”

Akenside's Pleasures of Imagination.

The importance of establishing a Botanical Garden at Philadelphia is obvious: it has, in fact, become a necessary institution, towards completing a medical education; according to the system of teaching medicine, pursued in the medical department of the University of Pennsylvania. In this respect, New-York has taken the lead of Philadelphia. Dr. David Hosack, professor of botany in the Medical School of New-York, established a Botanic Garden of about twenty acres, called the Elgin Botanic Garden, in the vicinity of that city, in the year 1801. This Garden is skirted around by forest-trees and shrubs, within the substantial enclosure of a stone wall; and on these grounds are erected extensive, commodious, and well constructed conservatories and hot-houses, which are furnished with a variety of plants, exotic and indigenous. The whole of this establishment was purchased from Dr. Hosack, by the state, in the year 1810: It is now under the direction of the regents of the University of that state.

Six years ago, the general assembly of Pennsylvania made some provision for such an institution: By a law passed the 19th

* Academus was an Athenian hero, from whom the original Academists, or that sect of philosophers who followed the opinion of Socrates, as illustrated and enforced by Plato, derived their name; Plato having taught his disciples in a grove, near Athens, consecrated to the memory of that hero.

† The Ilyssus is a rapid, but, when not swollen by rains, a small stream, of pure and limpid water, in the vicinity of Athens; and near the margin of which, in a vale at the foot of Mount Hymettus, is supposed to have stood the Grove, dedicated to Academus, in which the Socratic Philosophy was taught in its greatest purity.

which means, the Medical School in Philadelphia, connected with the University of Pennsylvania, now justly vies with that of Edinburgh, in celebrity.

of March, 1807, towards the close of Governor M'Kean's administration, three thousand dollars were granted to the trustees of the University of Pennsylvania, "out of the monies they owe the state; for the purpose of enabling them to establish a Garden for the improvement of the science of Botany, and for instituting a series of experiments to ascertain the cheapest and best food for plants, and their medical properties and virtues." But no application of this fund has yet been made, to the purposes contemplated by the legislature in their appropriation of it.

Mr. John Bartram, F. R. S. a distinguished botanist, though self-taught, is understood to have been the first anglo-American who executed the design of a Botanic Garden in this country. He laid out, and planted with his own hands, on his farm, pleasantly situated on the west bank of the Schuylkill and about four miles below Philadelphia, a garden of five or six acres; which he furnished with a great variety of curious, useful and beautiful vegetables, exotic as well as American. He acquired the greater part of the latter, in travelling through many parts of the continent, from Canada to the Floridas. His proficiency in his favourite science was, at a pretty early period, so great, that Linneus pronounced him, in one of his letters, to be the greatest natural botanist in the world. This Garden is now in the tenure and under the management of his son, the ingenious Mr. William Bartram, a well known cultivator of Natural History and Botany. Although this respectable man is above seventy years of age, he continues the most sedulous attention to his favourite pursuits. For a further account of Mr. John Bartram, see Dr. Barton's *Medical Journal*.

Mr. Bartram was born near Darby, in the (then) county of Chester, Pennsylvania, in the year 1701. He held the appointment of Botanist, for America, to King George III. until his death, which occurred in September, 1777, in the seventy-sixth year of his age.

The whole of the literary and scientific institution, thus formed—which, besides the Medical Schools,

(119) This highly important and well conducted institution owes its rise to the liberal contributions of several humane, charitable and public-spirited persons, aided by a legislative grant of two thousand pounds, Pennsylvania currency, (equivalent to \$5333 $\frac{1}{4}$) in the beginning of the year 1751: the first design, it is believed, was suggested by the late Dr. Thomas Bond, long an eminent physician in Philadelphia; and heretofore an active and useful member of the Philosophical Society, as well as sometime one of the vice-presidents of that body. By a law passed the 11th of April, 1793, the general assembly liberally granted ten thousand pounds (\$26,666,) out of the funds accruing to the loan-office of February 26, 1773; to enable the managers of the Hospital to make additions to their buildings, conformably to the original plan; and so to extend it as to comprehend a Lying-in and a Foundling Hospital,* so soon as specific funds for those purposes should be obtained.

The first twelve managers (whose names deserve to be held in remembrance, as prominent benefactors to their country,) were Joshua Crosby, Benjamin Franklin, Dr. Thomas Bond, Samuel Hazard, Richard Peters, Israel Pemberton, (then styled junior,) Samuel Rhoads, Hugh Roberts, Joseph Morris, John Smith, Evan Morgan and Charles Norris; and John Reynell officiated as treasurer: all of these were gentlemen of most respectable characters.

In order to obviate some objections, that were at first made, to the contemplated expense of the medical department of the institution, and which it was apprehended might obstruct the passage of the bill then depending in the legislature, by which the grant of the two thousand pounds, before mentioned, was ob-

* Towards the incorporation of either one or the other of these institutions with the present establishment of the Pennsylvania Hospital, the managers possess, also, sixteen shares of stock in the Bank of Pennsylvania, bestowed by the First Troop of Cavalry in Philadelphia. The product of this noble and very valuable donation, and which is considered as being equivalent to a capital stock of \$8503.33, will, most probably, be wholly applied to the support of a Lying-in Hospital, as part of the great institution.

was composed of the College, the Academy and the Charitable School, continued under the provostship of

tained from the public, Dr. Thomas Bond, together with his brother Dr. Phineas Bond, and Dr. Lloyd Zachary, generously offered to attend the Hospital, gratuitously, for the term of three years.

The Hospital establishment is now very complete, according to the original plan of this valuable institution; and, indeed, much beyond what was at first contemplated, in some respects: yet its utility might be much increased, by a further extension of the design. In its present condition, however, it reflects great honour on Pennsylvania, justly celebrated, as she is, for her charitable, literary, scientific, and other useful institutions; and the conduct of the managers has been uniformly such, as to entitle them to the gratitude of the community.

The Students in the Medical School of the University pay ten dollars per annum, for the privilege of attending the Hospital-practice, which is of very important advantage to them: and the physicians, with the managers, have generously appropriated a fund out of the monies, thus obtained, for the purpose of founding a Medical Library, and of purchasing the late Dr. Abraham Chovet's most curious anatomical preparations.* By these means, in addition to Dr. John Fothergill's valuable present, and other donations, this Hospital, with little expense of its more immediate funds, already possesses the most useful as well as ornamental collection, of the kind, that is to be found any where in America: and when the superbly magnificent painting, representing Christ healing the sick, (now in a train of execution by Mr. West, in London, and intended to be a donation from him to this Hospital,) shall have been received, this *chef-d'œuvre* of the sublime artist will constitute there, not only a noble monument of his liberality, benevolence, and attachment to his native country, but a splendid and admirably well-suited ornament to the institution possessing it. It is scarcely sixteen years since

* Thirty pounds a year were payable to Mrs. Abington, a daughter of Dr. Chovet, during her life, on account of this purchase. That annuity has very recently been extinguished, by the death of the annuitant.

the Rev. Dr. Smith, assisted by able teachers and professors,⁽¹²⁰⁾ from his induction in the year 1754, until the

the hospital-tickets of the medical pupils amounted to only about three hundred dollars per annum. This fund has been since increasing; the annual income to it being at present estimated at fifteen hundred dollars: it is now amply sufficient to supply the library belonging to the Hospital with new books, and to keep in good preservation the anatomical casts, &c.

As Dr. Franklin was eminently instrumental in promoting the establishment of the Pennsylvania Hospital, so he likewise bore a conspicuous part in the formation of the Library-Company of Philadelphia; an institution which holds a distinguished rank, for its usefulness, among the many that do honour to the capital of Pennsylvania. A public Library was first set on foot in Philadelphia by Franklin, about the year 1731; at which time he was scarcely twenty-six years of age. Fifty persons then subscribed forty shillings each, and agreed to contribute ten shillings annually, for that purpose. Some other companies for similar purposes had been formed in that city, after the one here mentioned; but these were soon after united with "The Library Company of Philadelphia." This Company now possess many thousand valuable books; and their stock is continually deriving accessions from donations, as well as from purchases. Besides the marble statue of Dr. Franklin, presented to the company by the late William Bingham, Esq. of Philadelphia, (which decorates the front of the Library-edifice,) and many other considerable benefactions to the institution, from time to time, "the Penn family" (as the late ingenious Dr. Henry Stuber, the continuator of the *Life of Franklin*, has remarked,) "distinguished themselves by their donations" to it. The Loganian Library was, a few years since, placed under the same roof with that of the Philadelphia Company; though in a distinct apartment. It consists of an extensive collection of curious, rare and valuable books, in various branches of ancient and modern learning: and for this noble benefaction to his native country, the public are indebted to James Logan, Esq. many years an eminent citizen of Philadelphia, and well known, not only throughout America, but in the old world, for his erudition and talents.

establishment of the University, in 1770:⁽¹³¹⁾ during which time, comprehending a period of twenty-five

Dr. Rittenhouse's intimate connexion with the College, and afterwards with the University of Pennsylvania, rendered it improper, in the opinion of the Memorialist, not to notice those institutions in the manner he has done : and in doing this, he could not without injustice omit a similar mention of the Hospital, so nearly allied to them through the Medical School of the former ; nor of the Philadelphia Library Company, which bears a close affinity to them all.

The name of Mr. West having been introduced on this occasion, the writer conceives it will not be thought foreign to the design of these Memoirs (though only incidentally connected with the present article), to make some further mention of a native American, whose name must ever hold a most conspicuous place in the history of the fine arts, in relation to this country.

This celebrated Artist is the youngest of ten children of John West, a person descended from very respectable ancestors, and a native of England. John early embraced the tenets of the people called Quakers. Migrating, in the year 1714, to Pennsylvania, where some members of the same family had arrived with William Penn about fifteen years before, he married and settled in the vicinity of Philadelphia ; and there his son Benjamin was born.

This gentleman's residence has been in England, during the last forty-five years : but he left his native country some considerable time prior to that period ; having first visited Italy, and some other schools of painting on the continent. When a Society of Artists was instituted in London, a few years after the accession of the present king to the throne, Mr. West (who had then recently arrived in England, on his return from Italy,) became a member of that body. Their exhibitions of painting, sculpture and architectural designs, became objects of attention to men of taste in the fine arts ;—" the young Sovereign," says Mr. West (in a letter to Mr. C. W. Peale, written in 1809,*).

* See the *Port Folio*, for January, 1810.

years, this seminary increased in reputation and flourished; and indeed it was indebted for much of its re-

"was interested in their prosperity." After the dissolution of that society, the king desired Mr. West and three other artists to form a plan for a Royal Academy; which having been approved by his majesty, he directed that it should be carried into execution. "Thus," continues Mr. West, "commenced the institution of the Royal Academy of London*:" And again, speaking of this patronage, he says;—"his majesty, by his regard for the arts, gave a dignity to them, unknown before in the country." Referring to this meritorious patronage of the fine arts by the present king of England, Mr. Latrobe (in his Anniversary Oration before the Society of Artists in Philadelphia, in May, 1811,) makes this just remark: "Nor ought we to omit mention of the name of George III. by whose patronage, our illustrious countryman, West, has become the first historical painter of the age."

(120) Of these, Francis Alison, D. D. a learned and worthy presbyterian clergyman, was vice-provost, and professor of moral philosophy; the Rev. Ebenezer Kinnersley, M. A. an eminent electrician and an amiable man, was professor of English and oratory; John Beveridge, M. A. an excellent scholar in the learned languages (some of whose Latin epistolary writings, in metrical language, after the manner of Horace, possess a considerable portion of merit and discover much classical purity of style,) was professor of languages; and Hugh Williamson, M. A. (now M. D.) a gentleman of distinguished talents, was professor of mathematics.

The last mentioned of these eminently meritorious characters is yet living. He enjoys the respect and esteem due to a man who, in the course of a long life, devoted much of his time and talents to the promotion of learning, useful knowledge, and the welfare of his country. Of the other three, who have, long since,

* When this Academy was first established, the celebrated Dr. Samuel Johnson was appointed 'Professor of Ancient Literature' in the institution; an office merely honorary.

spectability and usefulness to the zeal,⁽¹²⁾ the talents and the services of Dr. Smith.

passed on to "that bourn from which no traveller returns," the following circumstances are worthy of being preserved in remembrance, by those who shall hereafter record the history of literature and science, in this country.

Dr. Alison was one of the first persons in the middle colonies, who, foreseeing the ignorance into which this part of the country seemed inclined to fall, set up a regular school of education here. He was long employed in the education of youth at New-London Cross-roads, in Pennsylvania, before his appointment to the vice-provostship of the college of Philadelphia; and many persons, who afterwards made a distinguished figure in this country, were bred under his tuition. The University of Glasgow, being well informed of the pious and faithful labours of this valuable man, in propagating useful knowledge in these then untutored parts of the world, created him a Doctor of Divinity: He was honoured with this degree, without any solicitation whatever on his part.

Mr. Kinnersley possessed great merit, in the estimation of the learned world, "in being the chief inventor of the Electrical Apparatus, as well as author of a considerable part of those discoveries in Electricity, published by Mr. Franklin, to whom he communicated them. Indeed Mr. Franklin himself mentions his name with honour; though he has not been careful enough to distinguish between their particular discoveries. This, perhaps, he may have thought needless, as they were known to act in concert. But, though that circumstance was known here, it was not so in remote parts of the world, to which the fame of these discoveries has extended." The passage here quoted, is copied from an account of the college and academy of Philadelphia, published in October, 1758.

Dr. Franklin's experiment with the electrical kite—which established the theory on which the metallic conductors of lightning were introduced, for the security of buildings, and those within them, from injury by that element—was made in June, 1752; and his letter, giving an account of it, is dated the 19th

This gentleman was educated in the university of Aberdeen,⁽¹²³⁾ in Scotland, where he graduated as Mas-

of October following. But Mr. de Romas, a Frenchman, to whom his countryman the Abbé Bertholon ascribes the honour of the experiment with the kite, made his first attempt on the 14th of May, 1753 : he did not succeed, until the 7th of the next month ; a year after Dr. Franklin had completed his experiments, and then generally known in Europe. It is noticed by the late ingenious Dr. Stuber, of Philadelphia, in his continuation of the Life of Franklin, that " his (Dr. Franklin's) friend, Mr. Kinnersley, communicated to him a discovery of" (what Dr. Stuber terms) " the different kinds of electricity, excited by rubbing glass and sulphur." This, it is said, was first observed by Mr. Du Faye ; though afterwards not attended to, for many years. It seems, however, that the electricians of Europe, with Du Faye himself, had conceived a mistaken notion on this subject ; and that Franklin had, at first, adopted their doctrine. " But," says the continuator of his Life, " upon repeating the experiments, he perceived that Mr. Kinnersley was right ; and the vitreous and the resinous electricity of Du Faye were nothing more than the positive and negative states which he had before observed ; that the glass globe charged positively, or increased the quantity of electricity on the prime conductor,—whilst the globe of sulphur diminished its natural quantity, or charged negatively."

Mr. Beveridge, who was appointed by the trustees of the college and academy of Philadelphia, in June, 1758, professor of languages in that institution, was one of the ablest masters of the Latin tongue ; and wrote many poetical pieces in that language, in a style of superior purity and elegance. This excellent Latin scholar originally taught a grammar-school in Edinburgh, under the patronage of the celebrated Mr. Ruddiman. While in that station, he taught the Latin to Mr. Thomas Blacklock, the well-known blind poet ; and it was during this time, that Blacklock wrote his fine paraphrase of Psalm CIV. which his friend Beveridge afterwards rendered into Latin verse. A collection of Mr. Beveridge's poetical pieces, under the title of *Epistolæ Familiæres et alia quædam miscellanea*, was published at Philadelphia, in the year 1765.

ter of Arts. He soon after obtained clerical orders, in the Church of England; and, in the year 1759, he

(121) A Law Professorship was instituted in the College of Philadelphia, in the year 1790, and the Hon. James Wilson, LL D. (late one of the associate judges of the supreme court of the United States,) was appointed the first professor: the first course of lectures, under this appointment, was delivered in the winter of 1790-1. In April, 1792, when the College and University became united into one seminary, under the latter title, a Professorship of Law was erected in the new seminary; when Judge Wilson was again appointed to fill that chair: but no Law-lectures were afterwards delivered.

The lectures composed by the able and very learned Judge, for this department of the institution, are given entire in his works, published in three volumes octavo, in the year 1804, by his son Bird Wilson, Esq. president of the seventh judicial district of Pennsylvania.

It is much to be regretted, that this important chair in the University has remained unoccupied, since the death of its late eminent incumbent: For, as he has justly observed, in his *Introductory Lecture*, "The science of Law should, in some measure and in some degree, be the study of every free citizen, and of every free man. Every free citizen and every free man has duties to perform, and rights to claim. Unless, in some measure, and in some degree, he knows those duties and those rights, he can never act a just and an independent part."

(122) In an Account of Dr. Smith, prefixed to his posthumous works, the respectable Editor observes—that "Dr. Smith was actuated by a "zeal bordering on enthusiasm" (as he himself expressed it), in his devotion to the dissemination of literature and science."

(123) This University was founded in the year 1480; it consists of two colleges, called the Marischal and the King's College, under the name of the University of King Charles. The library belonging to this ancient university is large; and in both the colleges, the languages, mathematics, natural philosophy, divinity, &c. are taught by able professors.

was honoured with the degree of Doctor in Divinity, from the University of Oxford, on the recommendation of the archbishop of Canterbury, and the bishops of Durham, Salisbury, Oxford and St. Asaph.⁽¹²⁴⁾ About the same time, he received a similar degree from the University of Trinity-College, Dublin. Dr. Smith died the 14th of May, 1803, at the age of seventy-six years.

On the 10th of April, 1792, an act was passed by the general assembly of Pennsylvania, for the purpose of enabling the governor to incorporate a company for opening a canal and water-communication between the rivers Delaware and Schuylkill: and by this act, David Rittenhouse, William Moore, Eliston Perot, Cadwallader Evans, jun. and Francis Johnston, Esquires, were appointed commissioners to receive subscriptions of stock, for constituting a fund for this purpose.

Thus, after having been engaged in the course of eleven years, at a prior period, in the improvement of a great natural highway of his native country, he was again employed, in conjunction with others, by the legislative body of that country, after a lapse of nineteen years from the time of his first appointment to a similar duty, in forwarding the great design of uniting more intimately, and more beneficially for the pur-

(124) These prelates were, respectively, the Doctors—Secker, Trevor, Thomas, Hume, and Egerton.

poses of agriculture and commerce, the waters of the beautiful stream near whose banks he was born, with those of the majestic Delaware.

This comparatively inconsiderable appointment was presently after succeeded by a most important one. Dr. Rittenhouse was commissioned to be Director of the Mint, by President Washington, the 14th of April, 1793; but he did not take the requisite qualifications for that office, until the 1st of July following. He entered upon the duties of this arduous and very respectable station with great reluctance: it was, indeed, pressed upon him; not only by Mr. Jefferson, then secretary of state, with whom Dr. Rittenhouse had long been in habits of intimate friendship; but (through the means of Mr. Secretary Hamilton, of the Treasury,) by the illustrious President himself, who always entertained the highest regard for him: and this esteem was mutual, notwithstanding some "shades of difference" in the political tenets of these two great and good men; for no person could hold a more exalted opinion of the integrity, abilities, and public services of Washington, than Dr. Rittenhouse uniformly did. Such was the extreme diffidence with which our Philosopher accepted this appointment thus honourably conferred on him, that he declined, for a considerable time, to be sworn into office; until, finally, on applying to the writer of these memoirs, he obtained his promise to render such assistance to him as he should be able to do, in the event of his own inca-

capacity, from want of health or by reason of any incidental circumstance, to devote a sufficient portion of his time to the duties of the station. Although the writer was never required to act in the capacity thus proposed to him, circumstances not occurring to render it necessary, he shall always consider the arrangement then made upon the subject, on the voluntary proposition of Dr. Rittenhouse, as an estimable testimonial of his confidence in his friend and relative: yet the writer would have introduced the mention of these particulars, into the present work, with greater hesitation than he does, did he not conceive that a statement of facts of this kind will evince the delicate sensibility of Dr. Rittenhouse, on the occasion.

As soon as he had determined to accept the Directorship of the Mint, he began to make suitable arrangements for carrying the institution into operation. Towards this end, he suggested to the secretary of state the expediency of purchasing two contiguous houses and lots of ground, conveniently situated, for the establishment; in preference to taking buildings upon lease, for a purpose that seemed to require something like a permanent position. His proposal relative to this matter, it appears, was communicated to the secretary of state, for the purpose of being submitted to the consideration of the President: for, on the 9th of June, 1792, his approbation of the plan was expressed in the following note to the secretary.

"Dear Sir,

"I am in sentiment with you and the Director of the Mint, respecting the purchase of the lots and houses which are offered for sale, in preference to renting—as the latter will certainly exceed the interest of the former.

"That all the applications may be brought to view, and considered, for Coining &c., Mr. Lear will lay the letters and engravings before you, to be shewn to the Director of the Mint:—I have no other object or wish in doing it, than to obtain the best. Yours, &c.

"G^o. WASHINGTON.

"MR. JEFFERSON."

Dr. Rittenhouse executed this high trust with great ability and unimpeachable integrity, during three years; at the expiration of which he resigned it, on the 30th of June, 1795. He had, long before, expressed his anxious wish to retire from this station; but continued in office until that time, on the solicitation of the President and at the earnest desire of Mr. Jefferson.

As he was the first person appointed to that office, after the institution of the Mint under the present federal government of the Union, the duties that devolv-

ed upon him, in conducting it, were arduous and complicated. He directed the construction of the machinery; made arrangements for providing the necessary apparatus; and, in daily visits to the Mint, whenever his health permitted, personally superintended, with the most sedulous fidelity, not only the general economy of the institution, but its operations in the various departments;—duties, which his love of system and order, his extensive knowledge, and his practical skill in mechanicks, eminently qualified him to perform with peculiar correctness. At these times when he was prevented, by indisposition, from attending at the Mint in person, reports were made to him by the proper officers, either verbally or in writing, of the state of the institution and the progress of its business; and those officers received from him, on such occasions, the instructions requisite for their several departments.

In conducting the affairs of the Mint, Dr. Rittenhouse was seconded by capable and trusty officers; among whom was Mr. Voight, the Chief Coiner, with whose ingenuity and skill, as an operative mechanic, he was well acquainted, having long before employed him in that capacity, while he was engaged in constructing one of his Orreries and carrying on other branches of his professional business. Dr. Nicholas Way, a physician of some eminence, officiated at the same time as Treasurer of the Mint; and that respectable co-adjutor of the then Head of this important

institution in the national economy, has borne testimony to his scrupulous attention to the public interests, in its direction :—"I have been informed by his colleague in office, Dr. Way,"—says Dr. Benjamin Rush,⁽¹²⁵⁾ who succeeded that gentleman in the Treasuryship of the Mint,—“that, in several instances, he,” (speaking of the Director) “paid for work done at the Mint out of his salary,⁽¹²⁶⁾ where he thought the charges for it would be deemed extravagant by the United States.”⁽¹²⁷⁾

(125) See his Eulogium on Rittenhouse.

(126) His salary was two thousand dollars per annum.

(127) A particular instance, of a similar kind, occurred within the knowledge of the Memorialist. Mr. Peter Getz was, lately, a self taught mechanic of singular ingenuity, in the borough of Lancaster; where he many years exercised the trade of a silversmith and jeweller, and was remarkable for the extraordinary accuracy, elegance, and beauty of the workmanship he executed. This person was a candidate for the place of chief coiner or engraver in the mint; and, on that occasion, he offered to present to Dr. Rittenhouse, in the summer of 1792, a small pair of scales—such as are commonly called gold-scales—of exquisite workmanship as well as great exactness, as a specimen of his skill as an artist. The Director conceived, that an instrument equally well suited to the use for which this was designed, though less ornamental, could be procured for the mint, if desirable, for less money than this was worth as a matter of curiosity; he would not, therefore, purchase it for the mint: but being determined not to accept it as a present, and desirous at the same time to make compensation to the artist for his work, he insisted on his receiving twenty dollars for the instrument; on payment of which, he retained it himself.

When Dr. Rittenhouse resigned the Directorship of the Mint, in June 1792, he was succeeded in that office by Henry William De Saussure, Esq. of South Carolina, a gentleman of distinguished talents and respectability. But Mr. De Saussure did not long hold the appointment: Some invidious and illiberal, as well as ill-founded insinuations, were soon cast upon the establishment and the manner in which it was conducted, by certain persons in the government, who had very early evinced an hostility to the institution itself; and it is not improbable, that some of this description were also influenced in their inimical views towards it, by personal considerations. Mr. De Saussure, disgusted with such unworthy conduct, retired from the Directorship, after having held that office only a few months; during which short period, he executed his trust in such a manner, as to obtain the approbation of President Washington, and entitle him to the public esteem.

The following letter, which was addressed by Mr. De Saussure to the editors of the Charleston City Gazette, and published in that paper, soon after his resignation, will serve to elucidate this subject: as a vindication of that gentleman, and also of his predecessor, from the injurious aspersions so unjustly thrown out against the institution of the Mint by its enemies, that publication is entitled to a place in the Memoirs of Rittenhouse; it shall now close the narrative of Dr. Rittenhouse's connexion with the Mint.

“Messrs. Freneau and Payne,

“I was filled with no less indignation than surprise, on reading the debates in the house of representatives of the United States, on Tuesday the 19th of January, respecting the Mint, to find that a good deal of censure had been thrown out by some of the members against the management of that establishment, in such general and indiscriminating terms as might be deemed to implicate me, during the short time I was in the Directorship.

“Several members spoke in hasty and unguarded terms ; and one member, whose name the printer had not given, passed all the bounds of moderation. He is represented as having said, “that the institution is a bad one, and is badly conducted : it had been most scandalously carried on, and with very little advantage to the public. If the institution is not better carried on than it has been, it ought to be thrown aside.”
—If I could tamely endure these imputations, which in their generality may be supposed to reach me, I should be unworthy the esteem of my fellow-citizens.

“It ought, perhaps, to be sufficient for me to produce to the public eye the entire approbation which the President of the United States was pleased to express of my conduct, when quitting the office of the Director. I laid before him a full and exact state of the situation of the Mint, and of the coinage prior to,

and during my being in office. His approbation is contained in a letter which he wrote me at the moment of my leaving Philadelphia,—dated the 1st of Nov. 1795; from which these words are an extract—“I cannot, at this moment of your departure, but express my regret, that it was not accordant with your views to remain in the Directorship of the Mint: Permit me to add thereto, that your conduct therein gave entire satisfaction; and to wish you a pleasant voyage, and a happy meeting with your friends in South Carolina.”

“To those who know the President of the United States well,—who know the caution with which he is accustomed to speak, and that he possesses the talent of correctly estimating, as well as vigorously overcoming, the difficulties which present themselves in every circumstance of business,—this would rescue any character from the unqualified censure of the members of the house of representatives. But I will go further, and will shew the grounds on which the President formed his judgment, so that every man may form his own opinion.”

The Writer then proceeds with some details, respecting the condition of the Mint on his coming into office, and at the time he left it; in the course of which he states some difficulties, and unavoidable obstructions to the progress of the coinage, which existed in the time of his predecessor, and some of which could not be obviated while he remained in the direction :

and to this statement he annexes a table, exhibiting an account of the gold and silver coinage at the Mint, from its establishment to the close of October, 1795; at the foot of which he remarks, that "there never was any period at which the Mint was supplied with bullion, in a state for coinage, sufficient to keep it regularly and fully employed for any considerable time; except," continues the writer, "near the close of my direction; to wit, from the 1st to the 24th of October." Mr. De Saussure thus concludes his very satisfactory letter on this subject :

"Whilst I am vindicating myself from the censure, indiscriminately thrown upon the management of the Mint, I do by no means concede that the censure is justly applicable to my respectable predecessor. The solid talents of Mr. Rittenhouse will be remembered with pride, and his mild virtue recollected with tenderness, by his countrymen, when many of his censors will be forgotten in the silent dust. His lofty and correct mind, capable alike of ascending to the sublimest heights of science, and of condescending to regulate the minute movements of mechanical machinery, organized the Mint, and created the workmen and the apparatus; amidst the complicated difficulties from which the most persevering minds might have shrunk without dishonour. A very long and debilitating state of ill health prevented him from giving the establishment all the activity of which it was susceptible; and he long wished to retire before he was per-

mitted. His country suffered him to retire, without remembering, that it was the duty of a liberal nation to provide an independent retreat in his old age, for one of the noblest of her Philosophers; and to this neglect, it is attempted to add unmerited obloquy.

“I quit the ungrateful theme with disgust. I am consoled by the approbation of *him*, by whom to be approved, will gladden the heart through a long life. I rejoice that I quitted an office which subjects its holder to such unjust censure, by the advice of my friends, who in prophetic spirit told me, ‘that such offices were suited to men who could bear up against censure, though they did not deserve it,’ which they did not believe me formed to endure.”

“HENRY WM. DE SAUSSURE.

Charleston, S. C. Feb. 5. 1796.”

A national coin having been always considered as a proper, if not an absolutely necessary, attribute of the sovereignty of a state,⁽¹²⁸⁾ the establishment of a Mint, for the United States, was pretty early contemplated. A plan for that purpose was brought into the

(128) “Coinage is peculiarly an attribute of sovereignty: to transfer its exercise into another country, is to submit it to another sovereign.” See a Report made to congress, in the year 1790, by Thomas Jefferson, Esq. then secretary of state, on certain Proposals for supplying the United States with Copper Coinage, offered by Mr. John H. Mitchell, a foreign artist.

view of congress, in the last year of the war; although no national coinage was instituted until ten years afterwards. The early part of the year 1780 was extremely disastrous to the affairs of the United States. The fall of Charleston, S. C. depressed the spirits of the country : and the almost total failure of public credit, accompanied by a want of money, and other means of carrying on the war, about that period, paralyzed the measures of the government. Such was the apathy of the public mind, in regard to the perilous condition of the country at that crisis, that many members of the general assembly of Pennsylvania, which was convened on the 10th of May, in that year, came thither with petitions from their constituents, praying to be exempt from the payment of taxes.

But while this assembly were in session, a letter was received from General Washington by the Supreme Executive Council of the state, and by them confidentially communicated to the legislative body, in which the distressed condition of the army was faithfully described. Among other things the General stated, that, notwithstanding his confidence in the attachment of the army to the cause of their country, the distresses of the soldiery, arising from a destitution of those necessities which were indispensable, had become extreme ; insomuch, that appearances of mutiny were so strongly marked on the countenances of the army, as to occasion in his mind hourly apprehensions of the event.

This appalling information, and from such a source, elicited some latent sparks of public spirit. Voluntary contributions were immediately begun; and Robert Morris, Esq. a merchant of the highest credit—as well as a man whose patriotism, talents and enterprise, inspired confidence—contributed two hundred pounds, Pennsylvania currency, in (what was then called) *hard money*. This subscription commenced the 8th of June, 1780: but it amounted, in the whole to only 200*l.* hard money, and 101,360*l.* in the public bills of credit, or paper-money, denominated *continental*.

On the 17th of the same month, however, a meeting of the contributors to this fund (which was intended as a donation, towards carrying on the recruiting service,) and of others, was convened in Philadelphia; with a view to promote the object more extensively. At this meeting it was resolved—“to open a security-subscription, to the amount of 200,000*l.* in real money; the subscribers to execute bonds to the amount of their subscription, and to form a Bank thereon, for supplying the army.”

This was the origin of the “Bank of North-America,” which thus took its rise from an association of “a number of patriotic persons” in the city of Philadelphia. The plan they formed for the purpose was communicated to congress by the secretary at war, on the 20th of June; and the next day they were honoured with a vote of thanks.

On the 20th of February, 1781, Mr. Morris was unanimously elected by congress to the office of Superintendent of Finance, then first created. This gentleman arranged, in the spring following⁽¹²⁹⁾, the system of the present Bank of North-America; whereupon, many of the subscribers to the first-formed bank transferred their subscriptions to this institution. These were incorporated by an ordinance of congress⁽¹³⁰⁾, passed the 31st of December, 1781; and in the beginning of the succeeding year, this Bank commenced its operations in Philadelphia. By the incorporating ordinance, the following gentlemen were nominated by congress to be the president and directors of the institution, until a choice of a new direction should be made by the stockholders; namely, Thomas Willing, Thomas Fitzsimons, John Maxwell Nesbitt, James Wilson, Henry Hill, Samuel Osgood, Cadwalader Morris, Andrew Caldwell, Samuel In-

(129) The plan of the Bank of North-America, which was submitted to congress by their order, was approved by them on the 26th of May, 1781.

(130) When the question, respecting the incorporation of the Bank of North-America was taken in congress, twenty members voted in the affirmative and only four in the negative. But the votes were then taken by states; and of these, the delegates from New-York and Delaware were absent, Pennsylvania (having only two members of her delegation present) was divided, Massachusetts (having also but two members present) voted in the negative: all the southern states were in the affirmative, with the single exception of Mr. Madison's vote, his three colleagues (from Virginia) being on the affirmative side of the question.

glis, Samuel Meredith, William Bingham, and Timothy Matlack, Esquires. Mr. Willing, a merchant of high credit and respectability, was president of the board.

Some doubts having arisen, respecting the right of congress, under the then existing confederation, to exercise the power of erecting any corporate body, an act was passed by the general assembly of Pennsylvania, the 1st of April, 1782, to incorporate this Bank, in order to obviate such doubts. That act was repealed, the 13th of September, 1785; but on the 18th of March, 1787, the charter was renewed for the term of fourteen years, and has been since further continued.

It was by means of this establishment, that Mr. Morris, the superintendant of the finances, was enabled to support the public credit, and, in the words of Dr. Gordon, "to keep things in motion," at a most critical period of the American affairs, and when the national credit was in the lowest possible state of depression.⁽¹³¹⁾

(131) Whatever failings (and these were of a venial nature) may have appeared in the transactions of Mr. Morris, as a private citizen, in the latter part of a life long devoted to honourable and useful pursuits, yet the eminent services which he rendered to his country, in times of her greatest peril, entitled him to the gratitude of his compatriots; for, in his numerous and important official and other public negotiations, his honour and integrity were alike irreproachable. His merits ought not only to rescue his name from oblivion, but they give him a just claim to be

The establishment of a Mint seems to be a necessary appendage to that of a national Bank. Accordingly, Mr. Morris, in his capacity of superintendant of the finances, addressed a letter to congress, on the 15th of January 1782, "touching the establishment of a Mint." On the 21st of the succeeding month, they approved his proposal,—directing him, at the same time, "to prepare and report to congress a plan:" But nothing further appears to have been done in this business, until the 16th of October 1786, when congress passed "An Ordinance for the establishment of the Mint of the United States," &c.

About two years, however, after the commencement of the present federal government (viz. March 3. 1791,) a resolution of congress was passed, concerning the establishing of a Mint, under such regulations as should be directed by law. Previously to this, the late Alexander Hamilton, Esq. had communicated to the house of representatives, by their order, the result of his enquiries and reflexions on the subject, in a

placed in the list of American worthies; while his subsequent misfortunes — — — — — but,

"No further seek his merits to disclose,
Or draw his frailties from his dread abode,
(There they alike in trembling hope repose,)
The bosom of his Father and his God."

Gray.

Mr. Morris, who was long distinguished for his talents and his services in this country, was a native of Lancashire, in England. He died in Philadelphia on the 8th of May, 1806.

diffuse and masterly official report. In his report, this able financier, alike distinguished as a statesman and a soldier,⁽¹²²⁾ remarked, that "the unequal values

(132) "The task of re-creating public credit," (says Chief Justice Marshal, in his *Life of Washington*,) "of drawing order and arrangement from the chaotic confusion in which the finances of America were involved, and of devising means which should render the revenue productive, and commensurate with the demand, was justly classed among the most arduous of the duties which devolved on the new government". In discharging it, much aid was expected from the head of the treasury. To Colonel Hamilton† was assigned this important, and at that time intricate department.

"This gentleman was a native of the island of St. Croix, and, at a very early period of life, had been placed by his friends in New-York. Possessing an ardent temper, he caught fire from the concussions of the moment, and with all the enthusiasm of youth, engaged first his pen, and afterwards his sword, in the stern contest between the American colonies and their parent state. Among the first troops raised by New-York was a corps of artillery, in which he was appointed a captain. Soon after the war was transferred to the Hudson, his superior endowments recommended him to the attention of the commander in chief, into whose family, before completing his twenty-first year, he was invited to enter. Equally brave and intelligent, he continued in this situation to display a degree of firmness and capacity which commanded the confidence and esteem of his general, and of the principal officers in the army.

"After the capitulation at York-Town, the war languished throughout the American continent, and the probability that its termination was approaching daily increased.

"The critical circumstances of the existing government rendered the events of the civil, more interesting than those of the military department, and Colonel Hamilton accepted a seat in the congress of the United States. In all the important acts of

* This was in the year 1789.

† Afterwards promoted to the rank of Major-General.

allowed in different parts of the Union to coins of the same intrinsic worth ; the defective species of them, which embarrass the circulation of them in some of the states ; and the dissimilarity in their several monies of account, are inconveniences, which if not to be ascribed to the want of a national coinage, will at least be most effectually remedied by the establishment of one ; a measure that will at the same time give additional security against impositions, by counterfeit as well as by base currencies.”—“It was with great reason, therefore,” continues the Secretary, “that the attention of congress, under the late confederation, was repeatedly drawn to the establishment of a Mint ; and it is with equal reason that the subject has been resumed ; now that the favourable change

the day, he performed a conspicuous part, and was greatly distinguished among those distinguished characters whom the crisis had attracted to the councils of their country. He had afterwards been active in promoting those measures which led to the convention at Philadelphia, of which he was a member, and had greatly contributed to the adoption of the constitution by the state of New-York. In the distinguished part he had performed, both in the military and civil transactions of his country, he had acquired a great degree of well merited fame ; and the frankness of his manners, the openness of his temper, the warmth of his feelings, and the sincerity of his heart, had secured him many valuable friends.

“To talents of the highest grade, he united a patient industry, not always the companion of genius, which fitted him in a peculiar manner for the difficulties to be encountered by the man who should be placed at the head of the American finances.”

The disastrous death of this celebrated man happened on the 12th day of July, 1804, at the age of about forty-seven years.

which has taken place in the situation of public affairs, admits of its being carried into execution."

The Mint has been continued in Philadelphia, ever since its establishment,—a great commercial city being very properly considered the most suitable situation for such an institution: its operations have been conducted, for many years past, with activity; and there are few coins superior in beauty, to those of the American Mint.

In less than a year after Dr. Rittenhouse had engaged himself in the duties appertaining to the Directorship of the Mint, he was again called upon to assist his countrymen, by the aid of his talents, in effecting an important water-communication, inland, which was then contemplated. An association, called "The Conewago-Canal Company," was formed in Philadelphia, in pursuance of a law enacted the 13th of April, 1791; by which the sum of fourteen thousand dollars was appropriated, for the purpose of improving the navigation of the river Susquehanna, between Wright's Ferry (now the thriving town of Columbia) and the mouth of the Swatara. This company consisted of seventeen members, of whom Dr. Rittenhouse was one: and they were incorporated by an act of assembly, passed the 10th of April, 1793.

Just about this period, an occurrence took place at Philadelphia, then the seat of the national government,

which excited much public feeling at the time, and—contrary to the expectations of some good men of sanguine dispositions—became the source of many political evils, afterwards. This was the formation of what was called the Democratic Society; a political association, produced by the effervescences of the French revolution, while that all-important event was yet viewed in a favourable light by free nations: and of this society, Dr. Rittenhouse was elected President.

That Dr. Rittenhouse should have been selected as the President of the Democratic Society, and chosen for that station, can be readily accounted for. This gentleman had evinced, from the commencement of the troubles between the American colonies of Great-Britain and the parent country, an ardent attachment to the cause of his native land. The benevolence of his disposition rendered him the well-wisher of all mankind: hence every thing that, in his view, bore the semblance of oppression, was odious to him. But the wrongs which the country of his nativity, more particularly, experienced, from the unconstitutional claims of the British Parliament, roused those feelings of patriotism, with which his virtuous breast was animated, at the beginning of the American discontents: he was, therefore, an early and decided Whig; and the same principles that induced him to become such, continued to actuate him throughout the contest between the two countries.

The benignity of his temper must, nevertheless, have induced him to be truly rejoiced at the return of peace. When that happy event took place, he had too much goodness of heart to remember past injuries, too much understanding to be influenced by unworthy and mischievous prejudices; he had not a particle of malignity in his nature. At the period of the Declaration of American Independence by Congress, he believed, with a great majority of his countrymen, that necessity justified the separation: and from that epocha, he was heartily disposed to hold the mother-country, as his compatriots then declared they did the rest of mankind,—“enemies in war, in peace friends.”

When the French revolution commenced, the benevolence of his feelings led him to believe, as almost every American then did, that it would meliorate the condition of a great nation, whose inhabitants constituted a large portion of the population of the European world;—a nation, which, by the rigorous policy of its government, under a long succession of ambitious and arbitrary monarchs, anterior to the one then on the tottering throne of that ill-fated country, had become extremely corrupt among the higher orders of the people; and in which, the inferior classes were subjected to great oppression. The American people having, on their separation from the mother-country, instituted for themselves, as an independent nation, a constitution wholly republican; they were disposed to attribute the vices of the French government, be-

fore the revolution, to the circumstance of its being a monarchy, and the sufferings of the people of France, as necessarily resulting from the monarchical system of rule over them. When, therefore, a republican form of government was erected in France on the ruins of the throne; the excesses, and even the atrocities of the people, which attended the demolition of the ancient government of that country, and the establishment of political institutions entirely new to its inhabitants, found palliatives in the dispositions of most good men among us: they were ascribed to the strong conflicting passions naturally produced between the great body of the people, on the one part, and their rulers on the other; excited by the long sufferings of the former, and an unwillingness to part with power, in the latter. Great enormities were considered as the inevitable consequences of these opposite interests, when brought into action amidst a population of many millions of men, whose national characteristic is that of levity of temper and vehement passions; and a conflict, wherein all the malign dispositions of the most depraved characters, actuated by motives the most flagitious, intermingled themselves with the designs of those who meant well. Such men, freed from all the restraints of government and law, and utterly disregarding all the obligations of either religious or moral duties, had then an opportunity of giving a full vent to their views, whether of ambition, avarice or personal resentments; and they did not fail to embrace it. While, on the one hand, dema-

gogues fanned the popular flame by the vilest artifices; put on the semblance of patriotism, and by practising the most detestable hypocrisy, professed themselves to be the friends of the people, whom they were deluding into premeditated ruin. Even virtuous Frenchmen, and many of them possessing no inconsiderable share of discernment, soon fell victims to the machiavelian policy of these pretended patriots. These, in their turn, were sacrificed under the denunciations of their compeers, or other aspiring villains; and thus, others still in succession: until, finally, a fortunate military usurper, restored the monarchy in his own person, with absolute sway; and by substituting an horrible military despotism, in the place of a most sanguinary anarchy, confounded all ranks of his subjects in one vast mass of miserable slaves; who have been since employed in destroying the peace, freedom and happiness of their fellow-men, in other countries. Such have been, hitherto, the fruits of the French revolution; from which, at its commencement, myriads of good men fondly anticipated an issue precisely the reverse.²⁷⁽¹³³⁾

(133) The deleterious, though—as it might almost be called—fascinating influence, of the revolution undertaken by the people of France, extended itself far and wide, prior to the murder of their king, even in countries under the milder forms of government: many characters of great worth were every where misled by the plausibility of the avowed designs of its authors and supporters; and in no country was the infatuation more general, than in the United States. In England itself, it begat a kind of political frenzy; and, had not the wise and salutary

Notwithstanding the criminal excesses committed by many of the French revolutionists, before the institution of their short lived and turbulent republic, it was hoped by most true Americans, attached by fidelity as well as principle to that system of government, which was then the legitimate one in their own coun-

writings of the celebrated Burke arrested its progress, in good time, the most fatal consequences must have ensued. Among the literary and scientific men in Britain, who became deeply infected by the revolution-mania of that day, was Dr. Erasmus Darwin. Miss Anna Seward (one of his biographers) remarks, that the Doctor has introduced into his *Botanic Garden* an allegory, representing *Liberty* "as a great form, slumbering within the iron cage and marble walls of the French Bastile, unconscious of his chains; till, touched by the patriot flame, he rends his flimsy bonds, lifts his colossal form, and rears his hundred arms over his foes; calls to the good and brave of every country, with a voice that echoes like the thunder of heaven to the polar extremities;

"Gives to the winds his banner broad, unfurl'd,

"And gathers in its shade the living world!"

In consequence of Darwin's use of this grossly misapplied figure;—as the issue of the French revolution too fatally proves it to have been,—Miss Seward offers the following apology for the subject of her friendly pen:

"This sublime sally of a too-confiding imagination, has made the poet and his work countless foes. They triumphed over him," says his fair biographer, "on a result so contrary,—on the mortal wounds given by French crimes to real Liberty. They forget, or choose to forget, that this part of the poem (though published after the other) appeared in 1791, antecedent to the dire regicide, and to all those unprecedented scenes of sanguinary cruelty inflicted on France, by three of her republican tyrants; compared to whom, the most remorseless of her monarchs was mild and merciful."

try, that its ultimate establishment in France would produce permanent benefits, to that country at least, which would infinitely overbalance what were considered, by zealous republicans, as temporary and partial evils, such as seemed to be unavoidable, in bringing about a radical change in the fundamental institutions of a great and powerful empire. Many Americans were not, indeed, so sanguine in their expectations: but such were, nevertheless, the prevailing sentiments of the citizens of the United States,—even among the best-informed men.

The deliberative and cautionary proceedings (as they purported to be) of the more prominent revolutionary characters in France, in their minor popular assemblies, prior to the establishment of their national constitutional form of government, were judged of, in the United States, with respect to their objects and utility, as similar assemblies, under the denominations of councils of safety, committees of safety, &c. were considered by their own citizens, at the commencement of the American revolution: they were deemed to be necessary agents of the people in each country; respectively, during the interregnum which succeeded the abandonment of their ancient governments.

The Jacobin Club of Paris was one of these political engines of the French revolution, for some time after its commencement; and, perhaps, that assembly

contained many worthy members, originally, although it afterwards became notoriously infamous, by the monstrous enormity of the crimes it countenanced and produced.

Chief Justice Marshall has observed (in his *Life of Washington*,) that “soon after the arrival of Mr. Genet,⁽¹³⁴⁾ a Democratic Society was formed in Phila-

(134) Mr. Genet arrived in Philadelphia the 16th of May, 1793; and in the evening of the same day a meeting of the citizens was held at the state-house, when a committee was appointed to draw up an address to this minister from the republic of France: Mr. Rittenhouse was the first named on that committee. At a meeting of the citizens held the next day, he, as chairman of that committee, reported an address accordingly; which, being adopted by the persons then assembled, was presented to the new minister, the ensuing morning.

The president's proclamation of neutrality had then been issued between three and four weeks: the addressers therefore say, keeping this in their view; “Earnestly giving to the national exertions (of France) our wishes and our prayers, we cannot resist the pleasing hope, that although America is not a party in the existing war, she may still be able, in a state of peace, to demonstrate the sincerity of her friendship, by affording very useful assistance to her sister republic.”—The “useful assistance,” here alluded to, and which it was supposed France might derive from this country, “in a state of peace,” did not contemplate any infringement of the neutrality of the United States: Nor could Mr. Genet, himself, consider the language of the address in any other than its true sense; for, in his extempore answer, (a written one was also returned,) he says, “From the remote situation of America, and other circumstances, France does not expect that America should become a party in the war; but remembering that she has already combated for your liberties,

* It is dated the 22d of April, 1793.

delphia, which seems to have taken for its model the Jacobin Club of Paris :”—“Its organization,” continues the historian, “appears to have been completed on the 30th of May, 1793.”

It will nevertheless be recollected, that, about that period, the shock given to the humane feelings of the American people, by the murder of Louis XVI. their benefactor during the war in this country, and by the death and sufferings of his queen and family, had mostly subsided. The great American public still continued warmly and sincerely attached to what was then viewed as the cause of the French people : and therefore, whatever may have been the real design of settling up a Democratic Society in Philadelphia, at that point of time—a design only known to its founders,—it is certain, that many highly estimable and meritorious citizens, and firm friends of the existing government, were elected members of that society, without any previous intimation being given to them of such an intention : some of those persons never attended any of the meetings of the society ; and others soon

(and if it was necessary, and she had the power, would cheerfully again enlist in your cause,) we hope, (and every thing I hear and see assures me our hope will be realized,) that her citizens will be treated as brothers, in danger and distress.” This declaration of the French minister, made immediately after his arrival at the seat of the American government, forbade the addressers to believe, that either he or any other agent of the French government would afterwards undertake to violate the neutrality of the United States.

discontinued their attendance. If it were actually formed on the model of the Jacobin Club of Paris, by some of those with whom the scheme originated, it cannot be rationally presumed that men of great purity of reputation, in public as well as private life, would either seek admission into such an assembly, knowing it had any criminal views; nor would they, if chosen members of it without their knowledge and consent, participate in its proceedings, should these be found to be unconstitutional, illegal, or dishonourable. Yet it is a matter of notoriety, that persons of such characters were in some instances enrolled among the members of the Democratic Society in Philadelphia, at its commencement and soon after its organization, in the spring of 1793.

It may be readily supposed, that such of its members as meant well, would be desirous of placing at the head of that body, a man of unimpeachable patriotism and integrity; and it is equally reasonable to conclude, that, had there been a majority of its members, whose secret designs were inimical to the true interest of the country or the well-being of the government,—even these would wish to disguise their intentions, under the nominal auspices of a character universally respected and esteemed. Such a man was Dr. Rittenhouse; and therefore was he selected by the Philadelphia Democratic Society, as their President. At the time of his election to that station, he

held the highly important office of Director of the Mint, under a commission from President Washington; for whose public and private character he always entertained the most exalted respect, besides the personal regard, which the writer of these *Memoirs* knows to have subsisted between them. It is not presumable, taking all considerations into view, that Dr. Rittenhouse suffered any serious diminution in the esteem of that virtuous and discerning statesman, by the circumstance of the Doctor being placed at the head of the Democratic Society: for he not only continued to hold the Directorship of the Mint, but, when he offered his resignation of that high trust, two years afterwards, the President's reluctance to accept it yielded only to the Doctor's urgent solicitation to decline a further continuance in the office.

Whatever, therefore, may have been the real views and intentions of some of the members of the Democratic Society which was formed in Philadelphia, in 1793,—even if those of a majority of their number were highly unjustifiable,—no imputation, unfavourable to Dr. Rittenhouse's character, either as a good citizen or an upright man, could in the smallest degree be attached to him, by reason of his having been chosen a President of that body, at the time of its organization.⁽¹³⁵⁾

(135) Many months after the death of Dr. Rittenhouse, the same licentious writer who publicly charged him with being an

That Dr. Rittenhouse was a zealous advocate for the liberties of mankind, is unquestionable : but, much as he abhorred slavery and oppression of every kind, did he deprecate turbulence and licentiousness in the people, and wars of ambition, avarice or injustice, undertaken by their rulers. He was decidedly friendly to those measures of civil government, which are best calculated to maintain order, tranquillity, and safety in the state, on just and honourable principles. It can scarcely be doubted by any one, intimately acquainted with his character, that he must have concurred in sentiments similar to those attributed by the biographer of Washington to that great man, on this subject,—in the following observation : “ Between a balanced republic and a democracy the difference is like that between order and chaos. Real liberty, he thought, was to be secured only by preserving the authority of the laws, and maintaining the energy of government. Scarcely did society present two characters which, in his opinion, less resembled each other, than a patriot and a demagogue.”

Atheist, declared, in the same public manner, what was equally untrue. He asserted, not only that Mr. Rittenhouse “ volunteered as president of the Democratic Society, in Philadelphia,” but that “ he himself signed the inflammatory resolves against the excise-law, which encouraged the malecontents to rise in open rebellion.” The fact is, that the “ inflammatory resolves” referred to, were entered into by that body, on the 8th of May, 1794; and were not signed by Mr. Rittenhouse, but by another person, as “ President pro tem.”

Mr. Rittenhouse, it must be rationally supposed, was less acquainted with mankind, than General Washington was known to be: he had much fewer and more limited opportunities of studying human nature; and professions of pretended patriots were, therefore, more likely to impose on the unsuspecting honesty of his nature. He may even have been deceived, for a while, and ere the plausible fallacies of theorists in matters of civil polity, emanating from the philosophy of the French school, had yet been manifested to the world. A practical philosopher himself, he must have contemplated with pity, if not with indignation, the doctrines of the followers of Pyrrho: with whom it was a fundamental principle, that there is nothing that can be denominated true or false, right or wrong, honest or dishonest, just or unjust; or, in other words, that there is no standard beyond law or custom; and that uncertainty and doubt are attached to all things. Nevertheless, on these doctrines of the sceptical philosophers of antiquity are founded that monstrous and wicked tenet of most of the modern sceptics, that *the end justifies the means*!—a principle destructive of all the foundations of religion and morals. Well might the Abbé le Blanc exclaim, when noticing this mischievous sect of philosophers, seventy years ago,—“Is it not surprising, that men should endeavour to acquire the esteem of the public, by striving to break the most sacred band of all societies; in declaring their opinion to others, that there is neither virtue nor vice, truth nor doubt.”—“Our modern

philosophers,"⁽¹³⁶⁾ says the learned Abbé in another place, "have been *too confident*."

This is certainly correct, in one point of view; although the assertion seems to imply a contradiction in terms, so far as it applies to the metaphysical scepticism of many, assuming the honourable appellation of Philosophers, without being entitled to the true character. What were the sentiments of Dr. Rittenhouse, concerning the tenets of men of this description, may be fairly inferred, not only from the manner in which he has introduced the names of Berkeley and Hume into the Oration which he pronounced before the Philosophical Society, in the year 1775, but from other observations and reflexions contained in that discourse, as well as from the general tenure of opinions expressed by him on various occasions.

At an early period of the French revolution, a circumstance occurred, which, from its connexion in some particulars with the life of our Philosopher, is here entitled to notice.

(136) The Abbé le Blanc (or the writer who assumed that appellation) names, of this metaphysical tribe, Hobbes, Lord Shaftesbury, Tindal and Collins, all Englishmen; though his own country has long been the superlatively prolific soil of infidelity in religion, and chimerical theories in every department of science: such philosophers abound in France. He observes very justly, however, that "there is nothing so improperly made use of, as the name philosopher." See *Le Blanc's Letters on the English and French Nations*.

On the 7th of August 1783, and after peace had been proclaimed, congress unanimously passed a resolution in the following words—" Resolved, That an equestrian statue of General Washington be erected at the place where the residence of Congress shall be established ;—that the statue be of bronze: the General to be represented in a Roman dress, holding a truncheon in his right hand, and his head encircled with a laurel wreath. The Statue to be supported by a marble pedestal, on which are to be represented, in *basso relievo*, the following principal events of the war, in which General Washington commanded in person: the evacuation of Boston;—the capture of the Hessians, at Trenton;—the battle of Princeton;—the action of Monmouth;—and the surrender of York.— On the upper part of the front of the pedestal, to be engraved as follows: "The United States in Congress assembled ordered this Statue to be erected, in the year of our Lord 1783, in honour of GEORGE WASHINGTON, the illustrious Commander in Chief of the Armies of the United States of America, during the war which vindicated and secured their Liberty, Sovereignty and Independence."⁽¹³⁷⁾

(137) The legislature of Virginia, in their first session after the resignation of the Commander in Chief, passed the following resolution:—

" Resolved, that the executive be requested to take measures for procuring a Statue of General Washington, to be of the finest marble and best workmanship, with the following inscription on its pedestal.

This was an honourable testimony of the gratitude and affectionate respect of the nation, towards the Hero and Patriot, who so eminently merited both ; and it was a sincere effusion of the heart, in the representatives of the American people, while the transcendent virtues of a WASHINGTON, and his then recent services in his country's cause, yet inspired every generous breast with a faithful remembrance of his worth : It was a laudable proof of the patriotism that actuated the public mind, at a period, when, in the words of an enlightened historian,⁽¹³⁸⁾ "the glow of expression in which the high sense universally entertained of his services was conveyed, manifested a warmth of feeling seldom equalled in the history of man."

The fascination which the revolution of France spread over a large portion of Europe and America, for some time after its commencement, and during the

"The general assembly of the commonwealth of Virginia have caused this statue to be erected as a monument of affection and gratitude to GEORGE WASHINGTON, who, uniting to the endowments of the HERO, the virtues of the PATRIOT, and exerting both in establishing the Liberties of his Country, has rendered his name dear to his fellow-citizens, and given the world an immortal example of true glory."

This resolution was afterwards carried into effect: the statue which it decreed was executed by Houdon, and occupies a conspicuous place, in a spacious area in the centre of the capital at Richmond, in Virginia.

(138) Chief-Justice Marshall, in his *Life of George Washington*.

time it yet bore the semblance of a virtuous cause,—while it seemed to enchant the true friends of freedom every where ; and the oft-ressounded and captivating name of “ Liberty,” produced in men of ardent tempers, and speculative notions, ideas of its *reality* of the most extravagant nature, and in numerous instances of very mischievous tendency.

Among those of the latter description was Joseph Ceracchi, an Italian artist of celebrity. Mr. Ceracchi was a statuary, of great eminence in his profession; and to the manners and accomplishments of a gentleman, he united much genius and taste. Though born and bred in the dominions of the papal see, he fostered the principles of a republican. Conceiving that the genius of a free government comported with these alone, he became an enthusiastic admirer of the French *republic*. Finding the turbulent state of France, at the beginning of her troubles, unfavourable to the exercise of his art, in that country ; and believing as he did, that the tranquil and prosperous condition of the United States would afford full employment for his talents, in a manner congenial to his inclinations, as well as beneficial to his private interest; he arrived, with his wife—a German lady of some distinction—at Philadelphia, then the seat of the national government, sometime (it is supposed) in the year 1793.

The great equestrian statue, which congress had, ten years before, decreed to be erected in honour of

General Washington, had not yet been executed; and Mr. Ceracchi imagined that the gratitude of the American republic would furnish, besides this primary work, ample scope for the exercise of his talents, in erecting honorary memorials of some of the more illustrious characters, which the American revolution had produced. The aptitude, beauty and magnificence, which the artist designed to display in some great public monuments of this kind, were exhibited in models which he executed, for the purpose of testifying his abilities in the art he professed: these were universally admired, as the productions of superior genius, taste and skill. Yet Mr. Ceracchi remained unemployed: the national council did not, even at that late day, avail themselves of so favourable an opportunity of engaging him to erect the statue *decreed* to WASHINGTON,—a work which continues unexecuted at the present moment⁽¹³⁹⁾! and the talents of that eminent artist

(139) “If the example of all the republics that have preceded us did not authorize the hope, that history will not find us guilty of ingratitude, but only of delay, the national neglect of the memory of Washington would be sufficient to repress every sentiment of patriotism and public spirit. Of this neglect, aggravated by the solemn steps taken by congress to obtain a right to remove the body of the Founder of our Liberties to a place of public and honourable sepulture, and the abandonment of that right when obtained, it is painful to speak—nor is it necessary. There is not wanting a general sentiment of the disgrace which the nation suffers, while the body of Washington rests upon a trussle, crowded into a damp and narrow vault, in which the rapid decay of the wooden support must in a few years mingle his ashes with those of his worthy but unknown relations: Exertions not altogether worthy of the object, but such as the

were, not long afterwards, for ever lost to the country.

Among the gentlemen with whom Mr. Ceracchi became acquainted, in Philadelphia, were some members of the Philosophical Society in that city; and, on their recommendation of him, he was, himself, soon associated with this institution.

In this body, as the Writer believes, Dr. Rittenhouse acquired a knowledge of Mr. Ceracchi's person and character. Both Dr. and Mrs. Rittenhouse, from their kind and unceasing attentions to this gentleman and his wife, appear to have considered them as persons of merit: the Doctor, particularly, by his friendly deportment towards the husband, during the time he continued his residence in this country, testified the esteem he had conceived for this ingenious foreigner; heightened too, perhaps, by a delicate sensibility towards him, on account of the disappointment in his expectations of public patronage in his profession, which he experienced while here. For it is known to the Memorialist, that when, in consequence of such disappointment, Mr. Ceracchi became embarrassed in his pecuniary affairs, Dr. Rittenhouse contributed liberally to his relief.

present fashion of finance authorizes, are made, to give to his memory that honour in other cities, which is denied him in the metropolis of the Union." [See the *Ann. Oration delivered before the Society of Artists, in Philadelphia, in May, 1811, by B. H. Latrobe, Esq.*]

Some time in the summer of the year 1794 (if the Writer's recollection be correct,) our benevolent philosopher having occasion to view the canal, intended to form a communication between the waters of the Delaware and the Schuylkill, invited Mr. Ceracchi to accompany him, for the purpose of examining the quality of the marble in the great quarries of that material, situated near the margin of the latter river, in the vicinity of the western end of the canal. The Memorialist joined in this little excursion, during which, Dr. Rittenhouse was, as usual, communicative, cheerful and instructive.

On inspecting the quarries just mentioned—so far as time then permitted an examination of them,—Mr. Ceracchi seemed to think they contained only laminated strata of stone; not massy blocks, without fissures or veins, like the marbles of Carrara, and those in some other parts of Europe: that, although this Schuylkill marble was generally of a good quality and of a whiteness sufficiently pure, it could not be obtained in masses thick enough for the larger subjects of fine statuary. Yet this artist observed, that a large proportion of the slabs appeared to be of dimensions suitable for various subjects of sculpture; and more especially, that they furnished an excellent material for many purposes, ornamental as well as useful, in public edifices and other structures⁽¹⁴⁰⁾. No

(140) Mr. B. H. Latrobe, in speaking of the great improvement in architecture recently manifested in Philadelphia, no-

other quarries of marble were viewed, on this excursion : but it is probable Mr. Ceracchi would have found the marbles of Hitner's and Henderson's quarries—which are at nearly the same distance from Philadelphia, though not situated very near the river Schuylkill—much better adapted in every respect, to the uses he contemplated. This unfortunate man appeared to have possessed, in addition to genius and fine professional talents, the exalted virtue of gratitude. Dr. Rittenhouse was his benefactor ; and the Philosophical Society had elected him a member of their body : a fine bust of the Philosopher in the antique style, was executed by Ceracchi in white marble, and by him presented to the Society, on the 6th of February, 1795. It is supposed that he left America about twelve months after this date ; and it is said, that he afterwards perished on a scaffold, in Paris, in consequence of its being alleged, that he was engaged in a conspiracy against the life of Bonaparte.

tices the peculiar advantages derived to that city, from the valuable marbles in its vicinity. “ The beautiful marble,” says he, “ with which this neighbourhood abounds, and the excellence of all other building materials, give to Philadelphia great advantages in this branch of the fine arts.” (See Mr. Latrobe's *Annual Oration*, delivered before the *Society of Artists*, in *Philadelphia*, May 8th, 1811.) The correct taste and superior skill of this gentleman, as an Architect and Civil Engineer, are well known in the United States. In Philadelphia, the *Bank of Pennsylvania* will, more especially, remain a lasting monument of his talents in architectural science, as well as of the excellent quality of the marble (for such purposes) of which that edifice is constructed.

In the spring of the year 1794, the Earl of Buchan, P. S. S. A. and James Anderson, LL. D. both distinguished characters in Scotland, were elected members of the American Philosophical Society, at Philadelphia : and it appears probable, from a note addressed to Dr. Rittenhouse by President Washington, that they had been put in nomination, or, at least, that their election had been advocated by the former, at the instance of the latter; the note is in these words—

“ The President presents his compliments to Mr. Rittenhouse, and thanks him for the attention he has given to the case of Mr. Anderson and the Earl of Buchan.

“ Sunday afternoon, 20th April, 1794.”

At the commencement of the following year, Lord Buchan⁽¹⁴¹⁾ wrote to Dr. Rittenhouse the following letter :

“ *Dryburgh Abbey, Jan. 12, 1795.*

“ Sir,

“ My worthy friend, Mr. John Miller, son of the eminent professor, John Miller, of Glasgow, whom I recommend to your attention, has charged himself with this letter, and will deliver to you a Writing-Box, which I dedicate to your use, as President of the Philosophical Society at Philadelphia, and to

(141) The Right Hon. David Stewart Erskine, is the present Earl.

your successors in office, as a testimony of my high esteem for your literary character and for that of the Society over which you preside.

“ This Box is made of Yew, of Black Cherry tree, and Acacia and Barberry, and veneered with Holly ; all the growth of my garden at this place, and joined, fitted and finished, by my own joiner, in this house.

“ On the lid is an authentic picture of Copernicus, and in the inside thereof is a similar one of Napier. That of Copernicus is from the accurate copy of the Chancellor Hupazzuoski's original picture, which was sent by the learned Dr. Wolf, of Dantzic, to the Royal Society of London ; and this limning of mine is most faithfully delineated and shaded, from a drawing made by Mr. Thomas Parke, of Picadilly, formerly a pupil of Valentine Green, engraver at London, from the picture in the Royal Society, on a scale proportional in all parts and with great fidelity ; so that I can assure you of my limning being a fac simile, as to the features and countenance. That of Napier⁽¹⁴²⁾ is in-

(142) John Napier, called Baron of Merchiston, in Scotland, was the eldest son of Sir Archibald Napier, of Merchiston, and was born in the year 1550. As Lalande, in his *Astronomie*, observes—“ he deserves to be celebrated in a book on Astronomy, for his invention of Logarithms, which he published in 1614. He had,” continues Mr. Lalande, “ at first concealed the principle of this discovery : but Kepler soon penetrated it ; and the son of Napier, in an edition of his father's work, which he published, explained the ground of the principles.”

need a most exquisitely beautiful piece, by John Brown, of Edinburgh, executed with the black-lead pencil, from an original portrait in the possession of Lord Napier; and, as a drawing with black-lead, excels, I believe, every thing of the kind now extant: Mr. Brown having by drawing, during twelve years in Italy, from statues, obtained a super-eminent accuracy and beauty of design.

“I consecrate this interesting piece of furniture to American Science, and to the Philosophical Society of Philadelphia: willing, however, that in consideration of the high esteem I bear to you personally, you should have the custody and use of it in your own house, during your life; producing it only to the Society for the use of the Secretary, when you think proper. I have subjoined by way of postscript to this letter, some particulars relating to the Residence of Copernicus, and his Tomb; which I wish you to communicate to our Society.”⁽¹⁴³⁾

“Permit me to repeat my earnest request, that you should be kind and attentive to the Bearer (and his Family,) who I hope will have the happiness to obtain a literary establishment in the United States, and

The son here mentioned, Sir Archibald, was promoted to the peerage by Car. I. in the year 1657, and was ancestor of the present Lord Napier.

An account of the Life and Writings of the Inventor of Logarithms was published by the Earl of Buchan. w. 2.

(143) See this Postscript, in the Appendix.

prove of much utility to the public. I am, Sir, with esteem, your obliged humble servant—

BUCHAN.”

“DR. RITTENHOUSE, Pres. of the Am. Phil. Society.”

This really “interesting piece of furniture” was viewed by Dr. Rittenhouse and the Philosophical Society, in the light it was intended to be,—as a mark of the Donor’s good-will towards this institution, and of his respect for the character of its President. The Box has been disposed of, agreeably to his Lordship’s desire : it is inserted in the list of Donations to the Society, prefixed to the fourth volume of their Transactions, under the date of May 15, 1795, and it is, at present, deposited in their Hall.

The friendship that subsisted between Dr. Rittenhouse and Mr. Jefferson, was produced, in a great measure, by the congeniality of these gentlemen in the concerns of science. The correct and penetrating mind of the former knew how to estimate at their just value, without over-rating them, the literary and scientific acquirements of the latter ; while, on the other hand, this last was fully capable of discerning the sublime genius and most extraordinary talents of that man whom he greatly admired. While Mr. Jefferson resided in Philadelphia, as secretary of State, he made frequent visits to Dr. Rittenhouse : he thus became intimately acquainted with his character, for which he conceived the highest respect ; and, as a mark of his esteem for

him, he presented him with his own bust, in the costume of the day, cast in plaster, from one in marble executed by Houdon, of Paris.

Mr. Jefferson has testified to the world the exalted opinion he entertained of our Philosopher. In his refutation of the Count de Buffon's preposterous theory, "of the tendency of nature to *belittle* her productions on this side the Atlantic," he makes the following remarks, on the assertion of another French philosopher⁽¹⁴⁴⁾—that America has not produced "one able mathematician, one man of genius in a single art or a single science:"—"In war," says Mr. Jefferson, "we have produced a WASHINGTON, whose memory will be adored while liberty shall have votaries, whose name will triumph over time, and will in future ages assume its just station among the most celebrated worthies of the world: when that wretched philosophy shall be forgotten, which would have arranged him among the degeneracies of nature. In physics," con-

(144) The Abbé Raynal. The Count de Buffon had conceived an opinion, which he endeavoured to establish by ill-founded arguments, that the animals common both to the Old and the New World, are smaller in the latter: that those peculiar to the New World, are on a smaller scale: that those which have been domesticated in both hemispheres, have degenerated in America: and, that, on the whole, this portion of the world exhibits fewer species. But Raynal went further: he has applied this "new theory" (as Mr. Jefferson calls it) of the ingenious French Naturalist, to the race of men, descendants of Europeans, in America. Mr. Jefferson has shewn the erroneousness of these theories, founded on palpably mistaken facts.

times Mr. Jefferson, "we have produced a FRANKLIN, than whom no one of the present age has made more important discoveries, nor has enriched philosophy with more, or more ingenious solutions of the phenomena of nature.—We have supposed Mr. RITTENHOUSE second to no astronomer living : that in genius, he must be the first, because he is self-taught. As an artist he has exhibited as great a proof of mechanical genius, as the world has ever produced. He has not indeed made a world; but he has by imitation approached nearer its Maker, than any man who has lived from the creation to this day."⁽¹⁴⁵⁾

Mr. Jefferson retained the highest esteem for Dr. Rittenhouse, during his life; and it is believed this sentiment was mutual. Letters of friendship were occasionally interchanged by them : part of one of the latest of these, is as follows :

"Monticello, Feb. 24, 1795.

"Dear Sir,

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* * * * * * * (146)

"I am here immersed in the concerns of a farmer, and more interested and engrossed by them, than I

(145) See Jefferson's *Notes on Virginia*, written in the year 1781.

(146) A considerable portion of this letter, in the beginning, is occupied with matters of business.

had ever conceived it possible. They in a great degree render me indifferent to my books, so that I read little and ride much; and I regret greatly the time I have suffered myself to waste from home. To this, indeed, is added another kind of regret, for the loss of society with the worthy characters with which I became acquainted, in the course of my wanderings from home. If I had but Fortunatus's wishing cap, to seat myself sometimes by your fireside, and to pay a visit to Dr. Priestly, I would be contented: his writings evince, that he must be a fund of instruction, in conversation, and his character an object of attachment and veneration.

"Be so good as to present my best respects to Mrs. Rittenhouse; and to accept, yourself, assurances of the high esteem of, dear sir, your sincere friend and humble servant,

"TH. JEFFERSON.

"DAVID RITTENHOUSE."

At this time, Dr. Rittenhouse still held the Directorship of the Mint, though he resigned it a few months after; and from that period, his health being then much on the decline, he seemed to be desirous of passing the remainder of his days in tranquillity, and an abstraction from all business and severe studies, in the society of his family and a few particular friends. He now received numerous proofs of the affectionate respect and high consideration, in which his person

and character were held; both among his own countrymen and in foreign nations. Many of his fellow-citizens were assiduous in their attentions to him: they frequently visited him; and, when he was suffering in his health, he experienced repeated acts of friendship and kindness:—President Washington often made calls upon him, and enquiries concerning his health; and among his other friends, the late Mr. Henry Hill and Mr. Robert Morris manifested towards him the kindest attentions.

In the spring of the year 1795, our amiable Philosopher was admitted a member of the Royal Society of London. He was apprized of this new mark of distinction conferred on him, by the following note, addressed to him by Phineas Bond, Esq. late the British Consul, resident in Philadelphia.

“ Chesnut Street, 15th June, 1795.

“ Mr. Bond has the honour to inform Mr. Rittenhouse, that he has received a letter from his friend Mr. George Chalmers, of the office of the Lords of the Committee of Council for Trade, &c. at Whitehall, in which he requests him to apprise Mr. R. of his election as a Fellow of the Royal Society of London, which took place on the 23d of April.

“ Mr. B. begs leave to congratulate Mr. R. on this new honour, to which his merits, as a Philosopher, so eminently entitle him.

“ DAVID RITTENHOUSE, ESQ:”

It was not until towards the close of the summer, that Dr. Rittenhouse received the certificate of his Fellowship, in the Royal Society. His Diploma, for this honour, bears date the 16th of April, 1795;⁽¹⁴⁷⁾ and was accompanied by the following letter :

“ Sir,

“ Having the honour to transmit to you the Diploma of your election into the Royal Society, as a foreign Member, I beg leave to congratulate you on this proof of the high esteem in which you are held by that illustrious body. I have the honour to be, with the greatest respect, Sir, your most obedient and very humble servant.

“ CHARLES PETER LAYARD.

“ R. Society’s Apartments, Somerset Place,

“ London, July 3d, 1795.”

The Royal Society of London has dealt out the honour of Fellowship with a sparing hand, to foreigners ; and very few Americans have been admitted into that body, at any time : the Writer does not recollect any others than Dr. Franklin, Dr. Johnson, for-

(147) Mr. Bond must have been mistaken, in the date he has assigned to the election of Dr. Rittenhouse ; or, perhaps, the date of the diploma has reference to the time of nomination : the variance in these dates is, however, unimportant.

The diploma, which is in Latin, being done on copper-plate, is in the usual form. It has the signatures of eight of the Fellows of the Society, besides those of the President and one of the Vice-Presidents.

merly of Connecticut, and the late Dr. Morgan and Mr. John Bartram, of Philadelphia, who were Fellows of the Royal Society before the American revolution; and since that period, he believes Dr. Rittenhouse to have been one of but two or three native Americans who have borne that mark of distinction.

Soon after Dr. Rittenhouse became associated with that illustrious band of scientific men, a letter was written to him by Mr. Lalande, the celebrated Astronomer of France; of which the following translation is given in this place, as it will be perused with interest by the reader versed in astronomy.

“ Paris, at the College of France, May 14th, 1795.

“ It is a long time, my dear Associate, since I have heard from you: but Mr. Adet, our worthy ambassador, will probably procure for me that satisfaction. You will see by the little history which I send you, that the troubles of the revolution have not impaired my labours; and that I have, now, twenty-seven thousand stars, observed.

“ I have seen with great pleasure, in the transactions of your Philosophical Society, the annular eclipse of 1791: ⁽¹⁴⁸⁾ I have calculated the conjunction

(148) The continuation of the 6th volume of the American Philosophical Transactions (published in 1809) contains various observations on the Annular Eclipse of the 3d of April, 1791, made at Greenwich, Paris, Cambridge in New-England, Philadelphia, and George-Town in Maryland. A recapitulation of

7^h 43' 19"; but I have been obliged to take one minute from the phases of the ring, and to suppose $\left\{ \begin{array}{l} 6^h 46' 30'' \\ 6 \ 53 \ 47 \end{array} \right\}$, in order to agree, either with your end of the eclipse, or the difference of meridians, already known with sufficient accuracy by the transit of Venus, which gives 9^h 10' 6"; and your eclipse gives 9^h 10' 3", or 5^h 0' 43" in relation to Greenwich.

"What has given me still greater pleasure, is, that the duration of the ring, as you observed it, agrees very well with the diameters of the Sun and of the Moon, which I have adopted in the third edition of my *Astronomy* (1792), and the diminutions that I there propose for eclipses; viz. 3⁷/₄ to be taken from the diameter of the Sun, and 2" from that of the Moon.⁽¹⁴⁹⁾

the results of the longitudes of Philadelphia and Cambridge, west from Paris, is made from the Transit of Venus, in 1769; the Transits of Mercury, in 1782 and 1789; this Annular Eclipse of the Sun, in 1791, and a Solar Eclipse, in 1806; the mean results of which, give

The Long. of Philadelphia, W. from Paris,	5 ^h 10'. 01",2
Do. of Cambridge, Do.	4. 53. 53

These observations were communicated to the Philosophical Society by Don Joseph J. Ferrer, of Cadiz, a very respectable astronomer, and a foreign member of the Am. Philos. Society.

(149) In the annular eclipse of the sun, on the 3d of April, 1791, as observed at Philadelphia by Mr. Rittenhouse, the formation of the ring is stated at 6^h 46' 11¹/₂" A. M. true time; and its rupture, at 6^h 50' 28". "I have," says Mr. Lalande (in his *Additions*, 1797,) "reduced the conjunction of it to 7^h 41' 19",

"I pray you to make many compliments for me, to the astronomers whom I knew, in your country, Mr. Willard at Beverley and Mr. Williams at Cambridge: Is there any other astronomer, now, who applies himself seriously to astronomy? I greet you with health and brotherhood.

"LALANDE.

"Professor of Astronomy, and Inspector of the College of France,⁽¹⁵⁰⁾ Cambray-Place."

'The mind of Dr. Rittenhouse, ever intent on doing good, was always zealously engaged on occasions which afforded him opportunities of contributing to the

and the difference of meridians $5^h 10' 3''$, greater by $7''$ than that given by Mr. Rittenhouse. This duration of the ring, gives for the latitude in conjunction $44' 57''$, which confirms the value of the diameters of the sun and of the moon, that I have given in the 3d edition of my *Astronomy*, and the diminution that I make in the eclipses, $3\frac{1}{2}''$ for the ray of the sun, and $2''$ for that of the moon. I have subtracted one minute of the time marked in the third volume of the Transactions of the Society of Philadelphia, for the formation and the rupture of the ring; but this correction was pointed out to me by the termination of the eclipse, as well as by the difference of meridians, which was ascertained by the Transit of Venus over the Sun."

(150) Mr. Lalande was first appointed to that station, in the year 1761. "The College of France," heretofore styled "The Royal College of France," was originally founded in the year 1530, by Francis I. but letters-patent were issued in favour of it in 1772, by the unfortunate Louis XVI. The present edifice, finished in 1775, gave new activity to the ancient establishment; and Lalande viewed it, when he wrote his *Astronomie*, as having been one of the best schools in the world for the sciences, but principally for astronomy.

rewards of merit and the promotion of beneficial establishments, or useful undertakings of any kind.

Such an occasion presented itself, at the close of the year 1795. His nephew Dr. B. S. Barton, to whom he was attached by the strongest ties of friendship, then held the Professorship of Botany and Natural History in the University of Pennsylvania: but a vacancy being at that time expected in the chair of the *Materia Medica*, which branch of medicine was then taught by Dr. Samuel Powell Griffiths, Dr. Rittenhouse exerted himself to obtain that appointment for his nephew; upon whom it was conferred soon after, in conjunction with the chair he already occupied.

With a view to the gratification of his anxious wishes, in the attainment of this object, Dr. Rittenhouse addressed himself personally to some of his colleagues in the board of trustees of the University: and to Dr. M'Kean, president of that board, he wrote the following letter⁽¹⁵¹⁾ on the subject.

(151) The original letter was politely presented to the author, by his venerable friend, the profound Lawyer and distinguished Patriot to whom it was addressed. On that occasion, Governor M'Kean expressed himself in terms of the highest respect and kindest regard for the memory of Dr. Rittenhouse, as one of his friends, whom, while living, he greatly valued for his talents and esteemed for his virtues.

" Philadelphia, Dec. 26th, 1795.

" Dear Sir,

" I am informed that Dr. Griffiths intends to resign his Professorship in the University, sometime this winter. On this occasion, I beg leave to recommend to your favourable notice my nephew, Dr. Barton. He certainly has abilities sufficient to enable him to be useful in any branch of medicine, and ambition enough to induce him to make the greatest exertions : Besides, the *Materia Medica* seems so nearly connected with Botany and Natural History, his favourite studies, that I flatter myself he will be successful in his intended application to the honourable Board of Trustees ; yet I am certain this will much depend on your interest. I am, Dear Sir, with the sincerest affection and esteem, your most obedient Servant,

" DAVID RITTENHOUSE. ⁽¹⁵²⁾


(Superscribed.)

" Hon. Thomas M'Kean, LL. D.
Chief Justice of Pennsylvania."

The affectionate regard and high respect which Professor Barton uniformly cherished for the person

(152) Dr. Rush has observed, in his *Eulogium* on Rittenhouse, that " There was no affectation of singularity in any thing he said or did. Even his hand-writing," said he, " in which this weakness so frequently discovers itself, was simple and intelligible at first sight, to all who saw it." As a specimen of this, a *fac simile* of the letter in the text is presented to the reader.

Superintention

Hon. Mr. Thomas McKean, 
Chief Justice of Pennsylvania

Philadelphia Dec 26th 1795

Dear Sir,

I am informed that Dr. Gifford intends
to resign his Professorship in the University sometime

and character of this worthy relative,—who, on all occasions, evinced himself to be his sincere friend,—cannot be better manifested, than by citing his own words. In his dedication to Dr. Rittenhouse, of a dissertation, entitled, *A Memoir concerning the fascinating faculty which has been ascribed to the Rattlesnake and other American Serpents*, is this passage —“In inscribing this Memoir to you, dear sir, I follow the regular course of my feelings, which, when I have received acts of friendship or kindness, ever lead me to acknowledge them. Whilst your example early implanted in me an ardent love of science, the assistance which you afforded me, by removing many of the obstacles that have opposed my advancement in life, has enabled me to devote a portion of my time to the cultivation of science; and thereby to increase the quantity of my happiness:” This was written just four months before the decease of our Philosopher. And in a subsequent inscription by the same gentleman,—that of his *New Views of the Origin of the Tribes and Nations of America*,—dedicated to Mr. Jefferson, and dated about a year after that event, he says: “The only dedications I ever wrote, were to two persons⁽¹⁵³⁾ whom I greatly esteemed and loved; the last, to a common friend, whose virtues and science endeared him to his country, and whose removal from us, we shall long have reason to deplore.”

(153) The first of these, in the order of time, was his eldest brother, the writer of these memoirs; the other was his uncle, Dr. Rittenhouse.

Soon after Dr. Priestley's arrival in Pennsylvania, our Philosopher became personally acquainted with him, and presently conceived for his fellow-labourer in science a sincere esteem. This was reciprocal; and, therefore, while the celebrated English philosopher remained in Philadelphia, and also when he occasionally visited that city after his removal to the town of Northumberland on the Susquehanna, he passed much of his time in Dr. Rittenhouse's family. So far as the pursuits of these gentlemen, in matters of science, were congenial—for, in some respects they were very dissimilar,—their opinions appeared to harmonize with each other: but, how far their sentiments accorded on other subjects, or whether at all, the Writer cannot undertake to pronounce; not possessing the necessary means to enable him to do so with a sufficient degree of certainty. Dr. Rittenhouse's intercourse with Dr. Priestley, either personal or epistolary, was, however, of short duration; being terminated by the death of the former, in little more than two years after the latter first came to Philadelphia. One of the last interviews which Dr. Rittenhouse had with his friend Priestley, was very shortly before our philosopher's death: he was one of a select few whom the writer had the pleasure of meeting at Dr. Rittenhouse's, to dine, on the 18th of March, 1796.

That learned and eminent foreigner,—for Dr. Priestley never became a naturalized citizen of the United

States,—died at Northumberland in Pennsylvania, at an advanced age, on the 6th day of February 1804.

The scanty remnant of life that yet remained to the great American Astronomer and Mathematician, was neither uselessly, nor altogether unpleasantly employed. In this interval of time, short as it was, such portions of it as afforded him some respite from sickness and pain, were either devoted to the society of his family and friends, or occupied in study. From these sources of rational enjoyment, he derived much comfort; and the solace he drew from them, was greatly heightened by the endearing attentions, which, amidst the rapid decline of his health and strength, he experienced, in an eminent degree, in the bosom of his affectionate family and some surrounding relatives. He was fully sensible of the approaching crisis of his disease; and he appeared to be quite prepared to meet the awful stroke, with the fortitude which a retrospective view of a well-spent life would naturally inspire; as well as with the resignation, which an entire confidence in the goodness, the wisdom, and the mercy of his omnipotent Creator, taught him to be a duty. His elevated conceptions of the Deity, together with his decided belief of the immortality of the soul, according at the same time with the doctrines of a pure religion, animated him with the steadfast hope of an happy futurity, worthy of a Christian and a Philosopher. His intimate knowledge of the sublimest works of creation, rendered him highly sensible of the wisdom and

power of the Great Supreme; while that knowledge, aided by the lights furnished by the Christian dispensation, led him to ascribe suitable attributes to the Author of Nature,—a Being infinitely good, as well as perfect: for, as he once familiarly expressed himself,⁽¹⁵⁴⁾ he was “firmly persuaded, that we are not at the disposal of a Being, who has the least tincture of ill-nature, or requires any in us.”⁽¹⁵⁵⁾

(154) In a letter written to the Rev. Mr. Barton, in Sept. 1755, when the writer was little more than twenty-three years of age.

(155) The extract from a letter to one of his friends, which Dr Rush has quoted in his *Eulogium* on Rittenhouse, furnishes additional testimony, if, indeed, any were wanting, of the exalted sense of Divine Goodness, that was entertained by our pious philosopher: “Give me leave,” says he, “to mention two or three proofs of infinite Goodness, in the works of Creation. The first is, possessing goodness in ourselves. Now it is inconsistent with all just reasoning to suppose, that there is any thing good; lovely or praiseworthy, in us, which is not possessed in an infinitely higher degree by that Being who first called us into existence. In the next place, I reckon the exquisite and innocent delight, that many things around us are calculated to afford us. In this light, the beauty and fragrance of a single rose is a better argument for Divine Goodness, than a luxuriant field of wheat. For, if we can suppose that we were created by a malevolent Being, with a design to torment us for his amusement, he must have furnished us with the means of subsistence, and either have made our condition tolerable, or not have left the means of quitting it at pleasure, in our own power. Such being my opinions, you will not wonder at my fondness for what Mr. Addison calls *The Pleasures of Imagination*: they are all, to me, so many demonstrations of Infinite Goodness.”

That such were also the sentiments of one of the greatest philosophers of the seventeenth century, a man alike celebrated

It is an observation of a judicious biographer,* that “nothing can awaken the attention, nothing affect the heart of man, more strongly, than the behaviour of eminent personages in their last moments; in that only scene of life where we are all sure, later or sooner, to resemble them.” The writer of these *Memoirs* feels a sort of pensive gratification, in having it in his power to announce the manner in which the great American Astronomer departed himself, during the closing scene of his life: The following information on this head, was communicated by the writer’s brother, Professor Barton, the deceased’s nephew and friend,—for some years, also, his family-physician; and who, in his medical capacity, attended him in the whole of his last illness.

“The last visit I ever received from Mr. Rittenhouse was about the middle of June, 1796. He called at my humble habitation in Fifth street, to inquire about

as a profound Mathematician, and a learned and pious Divine, is apparent from the following passage, in the first of Dr. Barrow’s two *Discourses on the Goodness of God*.

“Every pleasant object we view, every sweet and savoury morsel we taste, every fragrant we smell, every harmony we hear; the wholesome, the cheering, the useful, yea, the innocent and inoffensive qualities of every thing we do use and enjoy,” said this excellent person, “are so many conspicuous arguments of Divine Goodness.”

* Mr. Mallet, in his *Life of Lord Chancellor Bacon*.

my health, and to learn from me the result of the experiments and inquiries in which he knew I was, at this time engaged, concerning the mode of generation and gestation of our opossum, an animal to whose economy and manners he had himself paid some attention, and whose history he justly considered one of the most interesting in the whole range of zoology.

“It was on this occasion, that our excellent friend first informed me, that he had received a diploma from the Royal Society. He observed, with a tone of voice and with a certain expression of countenance, which were not calculated to afford me any pleasure, “that a few years ago, such a mark of respect from that illustrious body would have been received by him with pleasure and with pride.”

“In fact, Mr. Rittenhouse, now and for some months past, was strongly impressed with the idea, that his career of usefulness and virtue was nearly at an end. He had several times, during the preceding part of the spring and summer, intimated to me (and doubtless to others of his friends) his impressions on this head. In what precise condition of his system, whether physical or intellectual, these impressions were founded, I have only been able to form a distant, and unsatisfactory conjecture.

“A few days after this interview, viz. on the 22d of June, I was sent for to visit Mr. Rittenhouse. I found

him in his garden, where he loved to walk, and soon learned that he laboured under a severe attack of cholera, accompanied, however, with more fever than we generally find with this disease; and with a great increase of that violent pain and sense of oppression at the region of his stomach, to which he had been subject for at least thirty years. Notwithstanding his age, the debility of his system, and the unfavourable state of the season, I ventured to flatter myself, that the attack would not prove mortal. On the following day, however, finding him no better, but rather worse, I requested permission to call in the aid of another physician; and having mentioned the name of Dr. Adam Kuhn, that gentleman accordingly visited our friend, in company with me, during the remainder of his illness.

His febrile symptoms being very urgent, it was thought necessary to bleed our patient; and notwithstanding his great and habitual repugnance to the practice on former occasions, he now readily consented to the operation, on condition that I would perform it myself. The blood which was drawn, exhibited a pretty strong inflammatory crust; and the operation seemed to give him a temporary relief from his pain. Soon after this, his strength gradually declined; and on the third day of his illness, it was but too obvious, that our illustrious relative was soon to be separated from his friends. He expired without a struggle, and in the calmest manner, ten minutes before two o'clock on the morning of Sunday the 26th, in

the presence of his youngest daughter, Mrs. Waters, and myself. His excellent wife, who had ever been assiduous in her attention on her husband, both in sickness and in health, had retired from his chamber about two hours before, unable to support the awful scene of expiring genius and virtue.

“There can be no doubt, I think, that Mr. Rittenhouse, from the first invasion of his disease, or at least from the day when he was confined to his bed or room, entertained but little hopes of his recovery. He signed his will in my presence. He discovered no more solicitude about his situation, than it is decorous and proper in every good or great man to feel, when in a similar situation. During the greater part of his illness, he manifested the most happy temperament of mind : and it was only in the last hour or two of his life, that his powerful intellects were disturbed by a mild delirium. About eight hours before he died, the pain in the region of his stomach being unusually severe, a poultice composed of meal and laudanum was applied to the part. In less than two hours after the application, I called to see him, and upon asking him if he did not feel easier, he calmly answered, in these memorable words, which it is impossible for me to forget,—for they were the last he ever distinctly uttered, and they make us acquainted with the two most important features in his religious creed,—“Yes, you have made the way to God easier !”

“ Such were the dying words, as it were, of our illustrious relative and friend. He was dear to us both, to all his relatives and friends ; and to his country. To me, let me add, he was *peculiarly* dear. The most happy and profitable hours of my life were passed in the society of this virtuous man. I followed his footsteps in the wilderness of our country, where he was the first to carry the telescope, and to mark the motions and positions of the planets. In the bosom of his family, I listened to his lessons, as an humble disciple of Socrates, or Plato. Science mixed with virtue was ever inculcated from his lips.—But to me, Mr. Rittenhouse was more than a friend and preceptor. He was a father and supporter. He laid the foundation of what little prosperity in life I now, or may in future, enjoy : and if it shall ever be my fortune, either by my labours or my zeal, to advance the progress of science, or to reflect any honour upon my country, I should be the most ungrateful of men, if I did not acknowledge, and wish it to be known, that it was DAVID RITTENHOUSE who enabled me to be useful.”

Such was the death of DAVID RITTENHOUSE,—soon after his entrance into the sixty-fifth year of his age : —“ Thus, with a heart overflowing with love to his family, friends, country, and to the whole world, he peacefully resigned his spirit into the hands of his

God.”⁽¹⁵⁶⁾ Thus did his immortal soul gently pass away, from this transitory but variegated scene ; from a theatre of mingled afflictions and comforts, of privations and enjoyments, of absolute certainty with respect to the non-continuance of this state, and of equal incertitude as to our possible knowledge of the term of its duration :—And it is most confidently believed, that his departed spirit, while yet hovering on the confines of time, devoutly relied on being “promoted to a more exalted rank among the creatures of God.”⁽¹⁵⁷⁾

(156) Rush’s Eulog. on Ritt.

(157) Ibid.

THE CONCLUSION:
COMPREHENDING
A RETROSPECT OF THE LIFE
OF
DAVID RITTENHOUSE,
WITH
A DELINEATION OF HIS CHARACTER.

“IT has been the fashion of late years,” says his eloquent Eulogist,⁽¹⁾ “to say of persons who had been distinguished in life,—when they left the world in a state of indifference to every thing, and believing and hoping in nothing,—that *they died like Philosophers.*” RITTENHOUSE did not, indeed, die like a disciple of that new philosophy, referred to by the Eulogist,—like some of those modern pretenders to *illumination*, who have been struggling to resuscitate all the maddening dreams and absurdities of the Pyrrhonists of old : His last hours were similar to those, which graced the departure from the world, of a Newton and a Boyle, with very many illustrious Christians besides, who truly deserved the name of Philosophers ;—for, “*he died like a Christian*, interested in the welfare of

(1) Rush’s Eulog. on Ritt.

all around him—believing in the resurrection, and the life to come, and hoping for happiness from every attribute of the Deity.”⁽²⁾

By his last will and testament, which was not executed till the day preceding his death, Dr. Rittenhouse disposed of his estate in a very equitable manner, between Mrs. Rittenhouse and his two daughters, besides making a liberal provision for an amiable widowed sister, so long as she should live.

It appears, from an estimate of his estate made by himself, (and supposed to have been drawn up about a year

(2) “Astronomy, like the Christian religion, if you will allow me the comparison,” said our philosopher, “has a much greater influence on our knowledge in general, and perhaps on our manners too, than is commonly imagined. Though but few men are its particular votaries, yet the Light it affords is universally diffused among us; and it is difficult for us to divest ourselves of its influence so far, as to frame any competent idea of what would be our situation without it.” See Ritt. Orat.

In another part of his Oration is this passage—“Our Religion teaches us what Philosophy could not have taught: and we ought to admire, with reverence, the great things it has pleased Divine Providence to perform, beyond the ordinary course of nature, for man, who is, undoubtedly, the most noble inhabitant of this globe,” &c.

And in addition to these sentiments, uttered and published by our philosopher himself, let the testimony of Dr. Rush, who had long and intimately known him, be quoted, from the learned professor’s *Eulogium*: “He believed in the Christian Revelation,” says the Doctor; and then subjoins—“Of this he gave many proofs; not only in the conformity of his life to the precepts of the Gospel, but in his letters and conversation.”

before his death,) that all the property he ever acquired, independently of his patrimony, which he valued at one thousand pounds, actually cost him only 13,525*l.* :⁽³⁾ and the whole of his estate was estimated, at the time of his decease, at scarcely twenty thousand pounds. When it is considered, that the talents of this very extraordinary man were actively and industriously employed more than forty years, from the time he attained to manhood, during many years of which period, he was engaged in various public occupations, and some of them lucrative; that he was prudent and exact in all his transactions, private as well as public, and economical in his domestic expenditures; and that his family was small;—when all these considerations are taken into view, they furnish matter of surprize that he should not have accumulated a larger fortune! Indeed the moderate amount of the estate he left, affords reasonable grounds for supposing, that he devoted more of his property to purposes of beneficence, than the world had any opportunity of becoming acquainted with.

Dr. Rittenhouse survived both his sons-in-law; and their widows⁽⁴⁾ are his only remaining children. He

(3) Equivalent to 36,066½ American or Spanish dollars.

(4) The elder of these ladies became, in the year 1788, the second wife of Jonathan Dickinson Sergeant, Esq. late an eminent lawyer in Philadelphia, and sometime attorney-general of Pennsylvania. This gentleman was one of the five persons delegated, on the 20th of February, 1776, by the convention of New-

constituted these daughters, with Mrs. Rittenhouse, the executrices of his will.

The remains of our philosopher were deposited, agreeably to a desire he had expressed long before his death, beneath the pavement within the small Observatory which he erected many years before, in the garden adjoining his house; and over the body was placed a plain slab of marble, inscribed only with his name, the time of his decease, and his age. Although

Jersey (where he then resided,) to represent that colony in congress: his colleagues were, the late governor Livingston, and John de Hart, Richard Smith, and John Cooper, Esquires. Mr. Sergeant died of the yellow fever in Philadelphia, on the 8th of October, 1793; after having been many weeks actively and benevolently employed, with a few other gentlemen of humanity, in the prosecution of such measures, as the sufferings of those of the citizens who had not fled, and the general welfare of the city, required, at that calamitous period. He left issue a son and two daughters, by this marriage, besides several children by his first wife.

The other daughter of Dr. Rittenhouse was married in the year 1790, to Nicholas Baker Waters, M. D. of Philadelphia, a young physician of respectable talents and amiable disposition. Dr. Waters died of a pulmonary disease, in August, 1794, at a very early age, leaving one son, an only child.

Dr. Rittenhouse named his second daughter, Esther, in compliment to his sister Barton. In a letter to the Rev. Mr. Barton, written on the occasion of the birth of this younger child, he says—"To me, it is a matter of indifference, but to my Eleanor it was a great disappointment, to have a girl, having promised herself a boy; and it had long since been resolved that this child, if a son, should be called Thomas, after yourself." The eldest daughter was named Elizabeth, after his own mother.

it was intended that his interment should be attended by his family-connexions alone,—in consequence of which, no other persons were asked to the funeral,—a numerous body of his friends voluntarily presented themselves on the occasion, as a mark of their respect for his memory. The Rev. Dr. Green was one of the number; and this clergyman, being then the pastor of the congregation in which the deceased had often attended divine worship in the latter years of his life, delivered a short but appropriate address to a surrounding auditory of mourning and afflicted friends.—“*This*,” began the reverend orator, pointing to the tomb of our philosopher, as just described,—“*This is, emphatically, the Tomb of Genius and of Science! Their child, their martyr, is here deposited,—and their friends will make his Eulogy, in tears. I stand not here, to pronounce it: the thought that engrosses my mind, is this;—how much more clear and impressive must be the views, which the late Spiritual Inhabitant of that lifeless corpse now possesses of God,—of his infinite existence, of his adorable attributes and of that eternal blaze of glory which emanates from Him,—than when she was blinded by her veil of flesh! Accustomed, as she was, to penetrate far into the universe,—far as corporeal or mental vision here can reach,—still, what new and extensive scenes of wonder have opened on her eyes, enlightened and invigorated by death! The Discoveries of RITTENHOUSE, since he died, have already been more, and greater,*

than while he lived.⁽⁴⁾ Yes; and, could he address us from the spiritual world, his language would be—

“ All, all on Earth is shadow, all Beyond
Is substance ; the reverse is folly's creed.”

Proceeding with a fervid expression of many excellent and pious sentiments, excited by the occasion and well adapted to it, the orator thus concluded :—“ Filled with these reflections, let us go from this Tomb, and resolve to aim at the high destiny of our nature. Rightly aiming at this, we shall fill up life with usefulness and duty; we shall bear its burdens with patience; and we shall look forward to its close with pleasure : we shall consider death but as the birth of a new and

(5) Dr. Rush has very beautifully expressed the same sentiment, in a passage of his *Eulogium* on our philosopher. After remarking, that his bodily infirmities “contributed much to the perfection of his virtue, by producing habitual patience and resignation to the will of heaven, and a constant eye to the hour of his dissolution,” he says : “It was a window through which he often looked with pleasure towards a place of existence, where, from the increase and perfection of his intuitive faculties, he would probably acquire more knowledge in an hour, than he had acquired in his whole life, by the slow operations of reason; and where, from the greater magnitude and extent of the objects of his contemplation, his native globe would appear like his cradle, and all the events of time, like the amusements of his infant years.” Such, too, must have been the ideas, impressed on the mind of Rittenhouse himself, when, in the morning of his life, he imagined the angel Gabriel looking down from the seat of perfect knowledge, and viewing, benignly, far from beholding with a smile of contempt, the efforts of Newton, to demonstrate the actual motion of our earth. W. B.

nobler existence,—as a dark but short passage to the regions of eternal day ; and, in the very agony of our change, we may exclaim in triumph,—‘O Death, where is thy Sting ! O Grave where is thy Victory !’—‘Thanks be to God ! who giveth us the victory, through our Lord Jesus Christ.’”

Dr. Rittenhouse was, in his stature, somewhat tall ; in his person, slender and straight ; and although his constitution was delicate, his bodily frame did not appear to have been, originally, weak : his gait was somewhat quick, and his movements in general were lively ; insomuch, that it is probable he possessed a good deal of corporeal activity, in early life.

His face was of an oval form ; his complexion, fair ; and his hair, which in his latter years became thinned and whitened, was brown. All his features were good : his forehead was high, capacious and smooth ; his eyes, which were of a greyish colour, were alike expressive of animation, reflection and good nature, and well placed under full, arched brows ; his nose was large, handsome, and inclined to the aquiline ; his mouth well-formed, though a little prominent, and corresponding with the general character of the face ; and his chin, broad and strong. In short, his whole countenance was indicative of intelligence, complacency and goodness, even after its characteristic marks had been in some degree impaired by sickness and years. Dr. Rush observes, that his countenance was too re.

markable to be unnoticed. "It displayed," says the Doctor, "such a mixture of contemplation, benignity, and innocence, that it was easy to distinguish his person in the largest company, by a previous knowledge of his character."⁽⁶⁾ Such were, upon the whole, the figure and appearance of David Rittenhouse; but more particularly, in his earlier life: and, as thus described, he was generally considered an handsome man.

Many indications of the respect and esteem entertained for the memory of this distinguished man, appeared soon after his death: among others may be mentioned the following.

Mr. Adet, then minister plenipotentiary from "The French Republic" to the United States, and resident in Philadelphia, addressed a letter on the subject of Dr. Rittenhouse, under the date of "19th Messidor, the 4th year of the French Republic" (answering to the 7th of July, 1806, of the Christian Calendar,) to the writer of these Memoirs. This gentleman—who was represented to be a man of considerable attainments in science, and was besides a member of the American Philosophical Society, professed, in that letter, *a great desire to make the name of Rittenhouse known in his country*,—for so he expressed himself; meaning, for that purpose, (as he said,) to transmit "to the National Institute of France an historical notice

(6) See Eulog. on Ritt.

of his life and labours." With this view, he accompanied his letter with a list of queries (twenty-five in number,) requesting the Memorialist to furnish answers to them; which was accordingly done, in a succinct manner: but whether the information the answers contained was ever applied to the purpose for which the querist stated them to be designed, the answerer has never ascertained. He will, however, conclude his observations on this part of his subject, with barely remarking, that the last of the proposed queries is in these words—"How did he bear the approaches of death?—did he die like a Philosopher?"

It is a matter of general notoriety, that Thomas Jefferson, Esq. of Virginia, (late President of the United States,) succeeded Dr. Rittenhouse in the Presidency of the American Philosophical Society; having been first elected to that station on the 6th of January, 1797, while he officiated as Secretary of State, and during his residence in Philadelphia. Of this appointment, Mr. Jefferson was duly notified, by a letter addressed to him by the Secretaries, in behalf of the society: and, in his reply to that communication, the president-elect paid a just tribute of respect to the character of his great and virtuous predecessor, in these concise terms:—"Permit me to avail myself of this opportunity of expressing the sincere grief I feel, for the loss of our beloved Rittenhouse. Genius, science, modesty, purity of morals, simplicity of manners, marked him as one of nature's best samples of

the perfection she can cover under the human form. Surely no society, till ours, within the same compass of time,⁽⁷⁾ ever had to deplore the loss of two such members as FRANKLIN and RITTENHOUSE."

In England, the talents of Dr. Rittenhouse were well known, and his worth duly appreciated. Of this, no better evidence can be required, than the spontaneous admission of him, by the Royal Society of London, into a Fellowship of their illustrious body. But, as a further proof of the high respect in which his character was held in that country, the obituary notice of him, which appeared in the *European Magazine*, (a periodical work of merit and taste,) for July, 1796, is inserted in the Appendix.

Besides other evidences which appeared, soon after the decease of our most distinguished philosopher, demonstrate the high estimation in which his character was held, by some eminent men in official stations, several private gentlemen of worth and erudition, have, long since, continued to manifest a laudable disposition either to erect, or to institute, some respectable and suitable memorial in honour of his name : and it can scarcely be doubted, that a grateful sense of his ex-

(7) About twenty-six years and an half.—Dr. Franklin was President from the institution of the society, in Jan. 1769, until his death, on the 17th of April, 1790 ; and Dr. Rittenhouse, who succeeded him in Jan. 1791, continued in the office until he died, the 26th of June, 1796. W. B.

emphary virtues, his transcendent talents and important public services, will yet effect the accomplishment of some such patriotic design. An honourable effort of this kind by a number of liberal and public spirited gentlemen of the county of Chester, in Pennsylvania, has recently been made : and notwithstanding the failure of the attempt, it is due to the merit of those individuals who were most zealous in their endeavours to accomplish the object, to notice their benevolent intentions on the occasion. In the autumn of the year 1811, the sum of nearly eight thousand dollars was subscribed, towards the purpose of erecting and endowing an Academy within the borough of West-Chester. Doctor William Darlington, with some other friends of literature and science in his neighbourhood, proposed to name the designed institution "*The Rittenhouse Academy*:" but as the establishment of a similar one, in a distant part of the same county, was at the same time contemplated ; and, as the subscriptions to that proposed to be established in West-Chester, were, in the first instance, chiefly obtained in different parts of the county, for an institution then proposed to be called "*The West-Chester Academy*"—thus locating its situation exclusively to that borough ; it was not deemed expedient to vary the chartered name of this Academy, when it should be incorporated, from the one by which it was originally designated.

Such were the causes of the disappointment, in relation to the proposed *Rittenhouse Academy*: but they are evidently such as cannot in the smallest degree detract from the meritorious intentions of those gentlemen, who were desirous of giving the institution, in West-Chester, that respectable name; nor are they less indicative of the respect which was intended to be shewn to the memory of Rittenhouse.

In addition, however, to the evidence which has been tendered by others to the exalted merits of our Philosopher, the memorialist is happy in having an opportunity to introduce, on this occasion, the testimony of a gentleman who was very long and intimately acquainted with Dr. Rittenhouse—and, consequently, well knew his worth as a man. This representation being likewise made by a person whose conspicuous attainments in similar departments of science, and arduous employments in practical pursuits of the same description, render him eminently qualified to judge of his deceased friend's talents, he is by these means enabled to form a just estimate of his character. The person here referred to, is Andrew Ellicott, Esq. a gentleman with whom the writer of these Memoirs has been in habits of intimacy and friendship, many years. The information on this subject, communicated by Mr. Ellicott, being in the form of a letter addressed to the memorialist, he has given that communication a place in the Appendix.

That Dr. Rittenhouse had failings, cannot be questioned; since, to possess them, is the lot of every individual of our species. But his foibles—of whatever description they may have been—may be compared to some opaque spots, minute in size, which the prying eye of the astronomer has discovered to exist even on the glorious orb of the Sun; although these little *maculæ* are scarcely discernible by the generality of observers, by reason of the surrounding splendour of his beams: so, the diminutive failings which may be supposed to have existed in the character of our philosophical luminary, were rendered almost imperceptible, by the resplendency in which his great and numerous virtues were enveloped. It was said of that sublime artist, Sir Joshua Reynolds, by the late celebrated Edmund Burke, that he did “not know a fault or weakness of his, that he did not convert into something that bordered on a virtue, instead of pushing it to the confines of a vice.”⁽⁸⁾ Dr. Rittenhouse, in like manner, was perfectly uncontaminated by any vice; while “his virtues furnish the most shining models for imitation:” and, in regard even to his foibles, the declaration of his Eulogist, just quoted, that his virtues “were never obscured, in any situation or stage of his life, by a single cloud of weakness or vice,”⁽⁹⁾ may be fairly received in the same liberal sense, as

(8) See Mr. Malone’s Account of the Life and Writings of Sir Joshua Reynolds, prefixed to the works of Sir Joshua.

(9) See Rush’s Eulog. on Ritt.

Mr. Burke's expression concerning his worthy friend, Reynolds.

If a retrospect be now taken of the whole Life of our Philosopher, in whatever points of view it may be contemplated, the following characteristic traits will be found to be faithfully delineated; although it is at the same time acknowledged, that the portrait is still too incomplete to afford a perfect resemblance to the excellent character of the original.

In his temper, Dr. Rittenhouse was naturally placid and good-humoured; yet sometimes grave, and inclined to pensiveness. He was occasionally, though seldom, animated by a considerable degree of warmth: but he did not suffer himself to be influenced, on any occasion, by impetuous passions; nor did any man ever possess a temper more placable. His general deportment was gentle, unassuming and cheerful; such as corresponded with his modesty of disposition and the delicacy of his feelings.⁽¹⁰⁾ He possessed a good share of constitutional firmness of mind; and was seldom either much or long depressed, by such misfortunes or afflictions as bore chiefly upon himself: still, however, the great benevolence of his temper rendered him extremely sensible to the sufferings of others. The

(10) "His manners were civil and engaging, to such a degree, that he seldom passed an hour, even in a public house in travelling through our country, without being followed by the good wishes of all who attended upon him." Rush's *Eulogium* on Ritt-

bodily infirmities of such as came within his more immediate notice, and the privations occasioned by helpless indigence, more especially of aged persons, often experienced in him a consoling friend and a liberal benefactor; provided they appeared to be objects worthy of charitable assistance. But where the sufferings or wants of others evidently resulted either from confirmed inebriety or other vicious habits, or from indolence or censurable improvidence, he was not accustomed to extend the hand of charitable bounty with the same cordiality. His means of affording pecuniary assistance to such of his fellow-men as needed it, were circumscribed by bounds of moderate extent: yet, in proportion to his resources, his acts of charity were laudable in their degree, as well as in regard to the objects of his benevolence, and entirely destitute of ostentation: they were dictated both by the humanity of his heart and a sense of moral duty.

Notwithstanding the predominating mildness of his disposition, he was capable of being roused on some occasions, to pretty strong emotions of indignation; and nothing would excite these feelings in his mind more readily, or in a higher degree, than instances of great cruelty, oppression or injustice, whether of a public or private nature.⁽¹¹⁾

(11) Dr. Rittenhouse's brother Benjamin, in a written communication made to the writer of these memoirs in the year 1796, observes, that the Doctor, "when in health, was cheerful; and his passions, unless they were excited by the abuses and knavery

His long continued habits of contemplation and study, and his seclusion from the busy world until the full meridian of life, created in his mind a fondness for tranquillity. This disposition, co-operating with his humanity and love of justice, made him a friend to peace ; insomuch, that he deprecated a state of warfare, even in cases attended by colourable pretexts of right and expediency, for engaging in it. Hence, he could not refrain from attaching to the late warlike Sovereign of Prussia, "the mighty Frederick," the appellation of "Tyrant of the North and Scourge of Mankind ;"⁽¹²⁾ believing, as he did, that this monarch was more influenced by an unfeeling personal ambition and thirst of military fame, than either by the justness of his cause or a desire to promote the happiness of his subjects.

With such feelings and such views of the subject as these, our Philosopher could not consider that as a justifiable cause of war, which has not for its object, either the defence of a country against an hostile invader, or the security of the state and the support of the liberties of the people, against treasonable domestic insurrections.⁽¹³⁾

of men, either in public or private life, were moderate : but where he conceived that the interest or liberties of his country were endangered, he would, on those occasions, express himself with great warmth and asperity."

(12) See his *Oration*.

(13) It was publicly declared by the same acrimonious writer who charged Dr. Rittenhouse with being an atheist, (namely,

His habits and manners were such as comported, with the honest sincerity of his heart, the amiable simplicity of his whole character,⁽¹⁴⁾ and the nature of his

Mr. William Cobbett,) and with an equal disregard of truth, as has been already shewn, that the Doctor signed "the inflammatory Resolutions" of the Democratic Society against the Excise-law, which, as he alleged, produced the Western Insurrection in Pennsylvania, in the year 1794. Dr. Rittenhouse, it is well known, did not even attend the meetings of that society. This is admitted by Mr. Cobbett himself, in the following invidious paragraph, extracted from a pamphlet written and published by the late William L. Smith, Esq. of South-Carolina, and republished by Cobbett in his own works: it is in these words—"Rittenhouse was a great philosopher; but the only proof we have had of his political talents, was, his suffering himself to be wheedled into the presidency of the democratic society of Philadelphia; a society with which he was even ashamed to associate, though cajoled and flattered into the loan of his name."

(14) The memorialist cannot deprive himself of the gratification of introducing, on the present occasion, a little anecdote communicated to him by his friend, Francis Johnston, Esq. characteristic of our philosopher's amiable simplicity and benevolent disposition. Circumstances as unimportant in themselves, as the one here related, sometimes make us acquainted with the true character of individuals.

Colonel Johnston, who was bred a scholar, and held with reputation the rank of a colonel in the American service in the war of the revolution, was, at an early period of his life, a zealous admirer of the character of Rittenhouse. But long afterwards, and while the Doctor officiated as state-treasurer, that gentleman held the next great office in the financial department of the state. The connexion of those offices occasioned almost daily visits from the colonel to the state-treasury, and intercourse with the treasurer himself; and this produced a reciprocal friendship between the two gentlemen. "For a time," says Col. Johnston, "Dr. Rittenhouse managed the business of his office with the utmost attention and assiduity: but his all-capacious mind could

pursuits in life. He loved quiet and order, and preferred retirement to the bustle of the world : and these dispositions endeared to him the comforts of domestic society. He considered ambition, pomp and ostentation, as being generally inconsistent with true happiness. His sentiments respecting luxury are expressed in very energetic language, in his Oration : he viewed it as the constant forerunner of tyranny ; and both, as being, eventually, the means of destroying useful science, though professing to be its friends. Yet he was far from being inimical to that mutual “ exchange of benefits,”⁽¹⁵⁾ which is effected by means of foreign com-

no longer be restrained from its native pursuits ; his money and his counter, therefore, he resigned into the hands of his beloved wife, who, although possessed of all the feminine virtues, performed the arduous duties of the office with a masculine understanding, with accuracy and unwearied attention.”

“ My intimacy with Dr. Rittenhouse,” continues the colonel, “ introduced between us a concern in some property, in the western part of the city, which often induced us to walk out together, to visit it. That part of the property which laid on the main street, belonged to me ; and being more exposed to the depredations of the disorderly people who then inhabited that neighbourhood, was consequently often injured in the fences or board-inclosures. More than once, I have seen this philosopher, who never thought it any degradation of philosophy, to bow at the shrine of friendship, marching along my line of fence, and most industriously, and in a most masterly manner, with his own hammer and nails, mending or repairing the same.”

“ This anecdote I mention thus particularly,” adds the worthy colonel, “ with a view of shewing, that in addition to Dr. Rittenhouse’s other virtues, humanity and friendship were leading traits in his excellent character.”

(15) In expressing his admiration of “ that dispositions of lands and seas, which affords a communication between distant re-

merce; or to those intercourses of society, which augment our rational enjoyments: he was, in truth, a friend to beneficial trade, and approved of those "social refinements, which really add to our happiness, and induce us with gratitude to acknowledge our great Creator's goodness."⁽¹⁶⁾ But he justly distinguished between that sort of commerce with foreign nations, that conduces to the well-being of mankind, and such as is obviously immoral in itself, or deleterious in its consequences. Of both these latter descriptions, he considered the slave-trade; a traffic, against which he bore his testimony more than thirty-seven years ago: and,

gions, and a mutual exchange of benefits," Dr. Rittenhouse unquestionably had in view a commercial, as well as social, intercourse between the inhabitants of different climes: he was too enlightened a man, not to have been aware of its "benefits." "A civilized nation, without commerce," (as the writer of these memoirs had occasion to observe in a former publication,*) "is a solecism in politics. It is in the rudest state of mankind, only, that a people can exist, without any communication with other societies or commercial intercourse among themselves, every one supporting himself by his own labour. Indeed, so absolute a state of nature can only be conceived; but has scarcely existed in reality. The wants, the fears, the weakness, nay the very nature of man, constitute him a social animal: and, in the very origin of society, their mutual necessities, with the various talents, means, and opportunities of individuals for supporting them, must have produced a reciprocity of services, and an occasional interchange with one another of that property, which each had acquired by his own exertions."

(16) See his Oration.

* The true interest of the United States, and particularly of Pennsylvania, considered: published in 1786.

as Dr. Rush has emphatically observed in respect to what he had advanced in favour of Christianity, "the single testimony of David Rittenhouse," on the one side, "outweighs the declamations of whole nations," on the other. Commerce of an injurious nature, he viewed to be such as ministers more to the debauching luxuries of mankind, than to their necessities, conveniencies and substantial comforts.

No man had less of "the gloomy spirit of misanthropy," than Dr. Rittenhouse: his whole life evinced, "with what ardour," to use his own words, "he wished for the happiness of the whole race of mankind." And, that he detested penuriousness, the contemptuous manner in which he has treated the character of the miser, in his Oration, is sufficient to testify. A manly spirit of independence, on the one hand, and a disposition, on the other, to partake rationally of what are called the good things of the world, induced him to pursue, in his style of living, a middle course, between extreme parsimony and a prodigality equally censurable. He was therefore, an economist. "His economy," as Dr. Rush has justly remarked, even "extended to a wise and profitable use of his time:" for he was, when most in health, an early riser; and devoted much of his time to reading and other studies, when not otherwise engaged or usefully employed. So inestimable did our Philosopher deem this gift of heaven to man, that, says his Eulogist, he observed on a certain occasion, "that he once

thought health the greatest blessing in the world, but he now thought there was one thing of much greater value, and that was time."⁽¹⁷⁾

Though rather plain and simple than otherwise, in all his domestic arrangements, he lived well,—in the common acceptation of the phrase. Nor was he in any respect deficient in that decorum in his personal appearance, and in the modest appendages of his household, which corresponded with his character and station in society. There was not the least affectation of any thing like parade or splendour, in his manner of living. In his dress he was remarkably neat, correct and gentlemanlike: his house, with its

(17) In the year 1756, he made an eight-day clock, for his brother-in-law, Mr. Barton; over the dial-plate of which, was engraved this mementory motto—*Tempus fugit*; and underneath, this blunt but too often necessary precept—*Go about your business*.

On one description of the continental bills of credit, issued by congress during the American war, were represented a sundial and a meridian sun over it: above, the word "Fugio;" and beneath, these words—"Mind your Business." And on the reverse of a copper one cent piece, struck in the year 1787, in pursuance of a resolve of congress of the 6th of July in that year, are impressed the same device and mottoes as those last mentioned; corresponding with those adopted by our Philosopher, when only twenty-four years of age: a circumstance that shews, how early in life he had formed a just estimate of the value of time.

It may not be improper here to observe, that the various devices affixed to the continental money, as it was called, were much admired for their appropriate significancy; and that they were generally supposed to be the production of the late ingenious Judge Hopkinson, an intimate friend of Mr. Rittenhouse.

furniture were of a corresponding style of propriety; the mansion itself, with every thing appurtenant to it, seemed to denote its being the residence of good sense, elegant simplicity, and genuine comfort.

Neither the delicate state of his constitution, nor his almost unceasing employment, either in business or study, when enjoying his ordinary portion of health, permitted Dr. Rittenhouse to participate in the society of his friends, at his table, in that manner which an hospitable disposition and a desire to mingle in the conversation of estimable men, led him to wish. Yet he occasionally had a very few friends to dine with him; and on those occasions, he avoided every thing that could bear the least appearance of ostentation. He received, however, frequent visits in the evening, from persons whom he respected and esteemed,—at the time of taking tea, a beverage which was very grateful to him. It was on such occasions, more particularly, that he would unbend; he would then bear his part in reciprocations of amusement, as well as instruction, with great good humour, sometimes even pleasantry, if he were tolerably well. “As a companion,” says Dr. Rush, “he instructed upon all subjects:” an observation, of which the Writer of these Memoirs has, indeed, very often experienced the correctness; and there have been few men, perhaps, who ever had an opportunity of knowing his communicative disposition, from a personal acquaintance with him, that have not been either gratified or improved by his conversations.

But the same causes that prevented his seeing his friends, beyond the circle of his family-connections, at his own table, as often as the sociability of his temper must have prompted him to do, imposed on him the necessity of very frequently declining the acceptance of invitations from others ; more especially, for large dining parties, and companies of formal visitors : his habits of great temperance, a dislike of much ceremoniousness, and an economical disposition of his time, were further inducements to his declining, very generally, such invitations.

In domestic life his whole conduct was perfectly exemplary. No man was ever a better husband or father, or a more indulgent master ; nor was there ever a kinder relative. He educated his children very liberally ; and in the society of these, together with his wife, a woman of excellent understanding, he enjoyed in an high degree, and for some years, the delights of a rational and endearing intercourse. In this little family-society, he experienced a large portion of domestic happiness, no otherwise alloyed than by the bodily sufferings he occasionally endured. And, as Dr. Rush observes,⁽¹⁸⁾ — “ when the declining state of his health rendered the solitude of his study less agreeable than in former years, he passed whole evenings in reading or conversing, with his wife and daughters.” — “ Happy family ! ” exclaims his Eulogist, “ so much and so long blessed with such a head ! —

(18) See Eulog. on Ritt.

and happier still, to have possessed dispositions and knowledge to discern and love his exalted character, and to enjoy his instructing conversation !”

In his friendship, as in all his social affections, he was perfectly sincere ; for, his ardent love of truth led him to detest every species of dissimulation. He was warmly attached to many estimable characters, among those with whom he was acquainted ; and he enjoyed, in return, their friendship and respect : besides which, he possessed in an high degree the esteem of all his fellow-citizens, to whom his name and character were well known. With not a few persons, who were either distinguished by literature and science, or by ingenuity, and information on general topics or particular subjects of useful knowledge, he was in habits of intimacy : in the list of these, might be placed several of the most eminent and dignified characters in America.

Dr. Rittenhouse’s epistolary correspondence, even with his personal friends, was by no means extensive : indeed the most of these, after his removal to Philadelphia, were there his fellow-citizens. His almost incessant employment, either in public or private business, occupied his time so fully as to allow him little leisure, when in the enjoyment of health ; and sensible of the repeated inroads which the privation of this blessing made on his profitable time, he was covetous of every hour, in which his industry could be most conveniently as well as usefully engaged. He therefore,

like the celebrated Dr. Bradley,⁽¹⁹⁾ published little. Possibly, too, this circumstance in relation to both these great astronomers, may have been, in some degree, occasioned by similar motives, a natural diffidence in their own faculties, extraordinary as others knew them to be. The English philosopher is even said to have been apprehensive, that a publication of his works might prove injurious to his reputation; and, therefore, he suppressed many of his papers: but whether our astronomer made preparations for publishing any large systematic work, in his favourite science, cannot be ascertained; the probability however is, that he did not, for want of time and health to engage in such an undertaking.

That the world possess so few of Dr. Rittenhouse's philosophical papers, is a matter truly to be regretted: because records extensively promulgated, of the results of his numerous and laborious researches, concerning the most sublime and interesting operations of nature, would, beyond any doubt, have greatly added to the stock of human knowledge. And this regret is enhanced by the reflexion, that if the government of Pennsylvania could have conveniently pursued the plan proposed to them by the Philosophical Society,

(19) An eulogy of this great astronomer, celebrated for his discovery of the aberration and nutation, will be found in the History of the French Academy, for the year 1762. He was born in 1692; and died at Greenwich, in 1762, at the age of seventy years.

in the year 1775;⁽²⁰⁾ or, had that or some such measure been adopted eight or ten years afterward, when the revolutionary war interposed no impediment to an important public arrangement of that nature; the world would, in all probability, at this day be in the possession of many additional productions of his vastly comprehensive genius. His astronomical discoveries and other fruits of his prolific mind, recorded by his pen, would in such case, it may be reasonably presumed, have redounded to the honour of his country and the benefit of mankind. But, that an American citizen of slender fortune, one who was (to use the strongly expressive terms of the Philosophical Society, on the occasion just mentioned,) "indebted for bread to his daily toil,"—that a man, thus circumstanced, could be expected to contribute a large portion of his inestimable time, wholly unrewarded, either to the public interests or the acquisition of personal fame, would be an impeachment of his prudence. Dr. Rittenhouse was not gratuitously furnished with a complete Observatory and Astronomical apparatus;⁽²¹⁾ nor, besides, recompensed by a liberal com-

(20) See the Memorial of the Society to the General Assembly, dated the 6th of March, 1775; introduced in the foregoing pages.

(21) Observatories are indispensably necessary to the cultivation of astronomical science. There are many celebrated institutions of this kind, in various parts of Europe; and of these, the British isles may justly boast of possessing a large proportion in number, admirably fitted up with all the necessary apparatus. Some account of these will be found in other parts of this work.

pensation from the public purse; in order that he might be enabled to devote himself to the public service, in scientific pursuits: Flamstead, Halley, Bliss, Bradley and Maskelyne, were so rewarded. Each of these eminent astronomers held, at different periods, the lucrative and honourable place of Regius Professor, or Astronomer Royal, at Greenwich.⁽²²⁾

Besides the liberal and honourable provision made for eminent astronomers in Great-Britain, many of the most distinguished men of the same class, on the continent of Europe, have experienced the bounty of their respective princes and states. Such, among others, were the celebrated C. Mayer, Astronomer to the Elector Palatine and duke of Bavaria, at Manheim; Zach, Astronomer to the Duke of Saxe-Gotha, at Gotha; and Lalande, Professor of Astronomy and Inspector of the College of France, at Paris. These great philosophers have had splendid astronomical establishments provided for them, by their sovereigns; as is more particularly noticed in other parts of these memoirs. And the extensive work of Mr. de Zach, entitled, *Tabulæ Motuum Solis novæ et correctæ*, &c. (a large quarto volume in the Latin language,) was printed under the patronage and at the expense of the Duke of Saxe-Gotha, in the year 1792, and distributed gratis among many of the learned of the old and new world; an example of munificence worthy of imitation by all sovereign princes and states, who know how to estimate, as they deserve, such importantly useful productions of men eminent in science.

The time, in which the transcendent talents of such philosophers as have been here named, was employed, together with the products of their labours, were rightfully, under such patronage, the property of the public; while the time of our astronomer was with equal justice his own, and consequently the fruits of his time, genius, and labour, were, at least primarily, due to himself and his family.

(22) The famous English Observatory near Greenwich Hospital, and in the immediate vicinity of the town of Greenwich

Notwithstanding Dr. Rittenhouse's published writings are, for the reasons that have been assigned, not very extensive, his philosophical publications on various subjects, chiefly astronomical, are far from being inconsiderable in number; and some of them are highly important, while others discover the activity and force of his genius.⁽²³⁾ The following is a list of his papers communicated to the Am. Philosophical Society, and published in their Transactions; arranged

in Kent, (erected, on a commanding eminence one hundred and sixty feet above the level of the river Thames, in the year 1676, by order of King Charles II.) is still called Flamstead-House; Mr. Flamstead having been the first person appointed Regius Professor there.

(23) It is said of the celebrated Roger Cotes, by his friend and patron, the learned Dr. Richard Bentley, in his inscription upon the tomb of that great philosopher, at Cambridge, that—

*" Pauca quidem Ingenii sui pignora reliquit,
" Sed egregia, sed admiranda :"*

In like manner, though the writings of Dr. Rittenhouse are neither numerous nor extensive, some of his works are, nevertheless, so excellent and admirable in their nature, they exhibit such proofs of transcendent genius, that they will immortalize his name. And, as Cotes was prematurely taken away by death, or, as expressed in his epitaph,

" Immaturâ Morte præreptus ;"—

so, the actual term of Rittenhouse's life may be considered as having been much shortened by sickness. Franklin, who lived twenty years longer than our astronomer, published little in philosophy; yet this circumstance does not derogate from his claims to the character of a philosopher.

according to the dates at which they were severally read in the Society : viz.

1. The first volume, printed in the year 1771,²⁴⁾ contains—"A Description of a new Orrery; planned, and now nearly finished, by David Rittenhouse, A. M. of Norriton, in the county of Philadelphia : " communicated by Dr. Smith. Read, March 21. 1768.

2. "Calculation of the Transit of Venus over the Sun, as it is to happen, June 3d 1769, in Lat. 40° N. Long. 5^h. W. from Greenwich : " communicated 21st of June, 1768.

3. An Account of the Transit of Mercury over the Sun, Nov. 9. 1769, as observed at Norriton, in Pennsylvania, by Dr. Smith, and Messrs. Lukens, Rittenhouse, and O. Biddle, the committee appointed for that purpose by the Am. Philos. Society : drawn up and communicated, by direction and in behalf of the committee, by Dr. Smith—July 20. 1769.

4. Observations on the Comet of June and July, 1770; with the elements of its motion and the trajectory of its path; in two letters from David Ritten-

(24) A second edition of the first volume was published in the year 1789, in consequence of the extraordinary demand for that book, by reason of the very important papers respecting the Transit of Venus, contained in it.

house, M. A. to William Smith, D. D. Prov. Coll. Philad.⁽²⁵⁾ Communicated, Aug. 8. 1770.

5. An easy method of deducing the True Time of the Sun's passing the Meridian, per clock, from a comparison of four equal altitudes, observed on two succeeding days; by David Rittenhouse, A. M.⁽²⁶⁾ Communicated by William Smith, D. D. Prov. Coll. Philad.—Aug. 17. 1770.

6. Account of the Terrestrial Measurement of the difference of Longitude between the Observatories of

(25) Some further remarks respecting this comet, than those contained in Dr. Rittenhouse's communication, here referred to, will be found in an extract which has already been given, of his letter to the Rev. Mr. Barton, under the date of July 30, 1770.

(26) Mr. Francis de Zach (Astronomer to the duke of Saxe-Gotha,) in the explanation and use of his table, No. 38, entitled, "*Correctio horæ meridianæ prodeuntis ex altitudinibus correspondentibus Solis,*" says—"Tradit Clarissimus DAV. RITTENHOUSE, in Transactionibus Americanis (vol. 1. p. 155. edit. 2.), Methodum novum correctionis horæ meridianæ, absque tabulis, ex solâ observatione deducendæ; sed requiruntur, ad hoc, duorum dierum subsequentium altitudines quatuor æquales: id est, sub eadem altitudine manè et vesperi factæ, ad assequendam ex his, correctiones meridiei. Regulæ Clariss. Authoris sunt sequentes:" Mr. de Zach then lays down Dr. Rittenhouse's Rules, which will be found in the Transactions of the American Philosophical Society, already referred to; and adds—"Exempla hoc perspicuum reddent:" he next states two examples, from which he deduces proofs of the accuracy of Dr. Rittenhouse's method. See "*Tabulæ Motuum Solis, novæ et correctæ, ex Theoriâ Gravitationis et Observationibus recentissimis erutæ, &c. auctore Francisco de Zach:*" printed at Gotha, in 1792.

Norriton and Philadelphia; drawn up by the Rev. Dr. Smith, in behalf of Mr. Lukens, Mr. Rittenhouse and himself, the committee appointed by the Am. Philos. Society, for that purpose, agreeably to the request of the Astronomer-Royal of England. Dated, Aug. 17. 1770.

7. The second volume, printed in the year 1786, contains—An Explanation of an Optical deception. Read, March 8. 1780.

8. An Account of some Experiments on Magnetism; in a letter from Mr. Rittenhouse to John Page, Esq. of Williamsburgh. Read, Feb. 6. 1781.

9. A letter from David Rittenhouse, Esq. to John Page, Esq. in answer to one from Mr. Page;) concerning a remarkable Meteor, seen in Virginia and Pennsylvania, on the 31st of Oct. 1779. Read, May 2. 1783. (N. B. Mr. Rittenhouse's letter is dated Jan. 16. 1780.)

10. "Observations on a Comet lately discovered; communicated by David Rittenhouse, Esq.⁽²⁷⁾ Read, March 19. 1784.

(27) This Comet was observed by John Lukens, Esq. of Philadelphia, on the 20th of January, 1784. This respectable practical astronomer communicated his discovery of it to Dr. Ritten-

11. A new Method of placing the Meridian Mark ; in a letter to the Rev. Dr. Ewing, Provost of the University. Read, November. 1785.

12. An Optical Problem, proposed by Mr. Hopkinson, and solved by Mr. Rittenhouse. Read, Feb. 17. 1786. (N. B. Mr. Hopkinson's letter is dated March 16, 1785 : the answer is without date.)

13. Astronomical Observations ; communicated by Mr. Rittenhouse. Without date.⁽²⁸⁾

14. The third volume, printed in the year 1798, contains—An Account of several Houses, in Philadelphia, struck with Lightning on the 7th of June, 1789 ; by Mr. D. Rittenhouse and Dr. John Jones. Read, July 17. 1789.

house the next day, on the evening of which, ("assisted by Mr. Lukens and Mr. Prior,") he ascertained the then apparent place of this comet. Dr Rittenhouse's communication to the society, on this subject, gives also the apparent place of the comet on the 17th of February, being the last time the weather permitted him to see it: the result of his intermediate observations is also stated.

(28) These observations were made in Philadelphia, by Dr. Rittenhouse, at sundry times in the years 1784, 1785, and 1786, on the new planet, or Georgium Sidus ; and on the Transit of Mercury over the Sun's disk, on the 12th of November, 1782. The same communication also states the geocentric places of the Georgium Sidus, at several different dates between the 1st of April, 1762, and the 14th of March, 1784, both included ; as observed by Mr. James Six, at the city of Canterbury in England.

15. An Account of the Effects of a stroke of Lightning on a House furnished with two Conductors; in a letter from Messrs. David Rittenhouse and Francis Hopkinson, to Mr. R. Patterson. Read, October 15. 1790.

16. Astronomical Observations made at Philadelphia: viz. of a Lunar Eclipse, on the 2d of November, 1789; of the Transit of Mercury over the Sun's disk, on the 5th of November, 1789; of an Eclipse of the Moon, on the 22d of October, 1790; of an Eclipse of the Sun, on the 6th of November, 1790; and of an Annular Eclipse of the Sun, on the 3d of April, 1791:⁽²⁹⁾ with an Account of corresponding Observations of the two first of these Phænomena, made at the University of William and Mary in Virginia, by the Rev. Dr. Madison; and of the second, alone, made at Washington-College in Maryland, by the Rev. Dr. Smith: communicated by D. Rittenhouse. Read, February 4. 1791.

17. A Letter from Dr. Rittenhouse to Mr. Patterson, relative to a Method of finding the Sum of the

(29) This eclipse was observed by Andrew Ellicott, Esq. at the city of Washington, as follows; viz.

April 3d.	{	6. ^h 39'. 1",25	{	Annulus completed	{	M. Time.
		6. 43. 15,25		Do. broken		
		7. 55. 37,75		End of Eclipse.		

A letter from the celebrated French Astronomer, Lalande, to Dr. Rittenhouse, on the same subject, has been already given.

several Powers of the Sines, &c. Read, May 18. 1792.

18. An Account of a Comet, (first observed by Mr. Rittenhouse, on the 11th of January, 1793 :) in a letter from D. Rittenhouse to Mr. Patterson.⁽³⁰⁾ Read, February 15. 1793.

The fourth volume, printed in the year 1799, (three years after Dr. Rittenhouse's death,) contains—

19. A paper, “On the Improvement of Time-keepers;” by David Rittenhouse, LL. D. Pres. Am. Philos. Society. Read, November 7. 1794.⁽³¹⁾

(30) In this letter, Dr. Rittenhouse merely informs Mr. Patterson, in general terms, of the time when he first observed this comet, its then place, and its course through several of the constellations, until the 8th of February; on the evening of which day, he saw it for the last time. It is presumed that Dr. Rittenhouse's state of health, at that period, would not admit of his making more definite observations on this comet.

(31) This *desideratum* in astronomical science had long engaged Dr. Rittenhouse's attention; and it is confidently said by one of his intimate friends, that, in the latter part of his life, he had actually written much on the subject of Pendulums; intended, probably, for publication. But, unfortunately, the manuscript-book, which contained what he had thus written, can now be found.

In the paper mentioned in the text, he remarks, that “the invention and construction of time-keepers may be reckoned among the most successful exertions of human genius. Pendulum-clocks especially,” says he, “have been made to measure time with astonishing accuracy; and, if there are still some

20. A paper, "On the Expansion of Wood by Heat;" in a letter from David Rittenhouse, LL. D. Pres. Am. Philos. Society. Dated, May 15. 1795.

21. A Method of raising the common Logarithm of any number immediately; by D. Rittenhouse, LL. D. Pres. Am. Philos. Society. Read, August 12. 1795.

22. A communication, "On the Mode of determining the true Place of a Planet, in an elliptical Orbit, directly from the mean Anomaly by Converging Series;" by David Rittenhouse, Pres. Am. Phil. Society. Read, February 5. 1796.

This last communication was made to the Society, within five months of the time immediately preceding Dr. Rittenhouse's death.

causes of inequality in their motions, the united efforts of mechanism, philosophy and mathematics, will probably, in time, remove them."

Indeed no man has done more, none perhaps so much, towards removing the imperfections in chronometers, to which he alludes, as this great mechanician himself. His admirable time-piece, now in the possession of the Philosophical Society at Philadelphia, constructed by him, on an improved plan of his own, affords ample proof of the "astonishing accuracy" (as he expresses it) to which the pendulum-chronometer may be brought. A description of the mechanism of this extremely accurate time-piece, as well as of the principles on which its superior correctness depends, is inserted in the Appendix.

It is a strong evidence not only of our **Philosopher's** industry, but of his attachment to that institution of which he was so great an ornament, that, in the course of the twenty-six years during which he was a member of it, he could find sufficient leisure,—almost constantly employed, as he was, in important public business, and frequently bereft of health,—to contribute so many valuable papers as he did, to the too scanty stock of its published Transactions. **Dr. Franklin**, who was a member of the **Philosophical Society**, and their president, for twenty-one years, furnished them with only eight communications during that time : and **Mr. Jefferson**, who has nominally occupied the president's chair⁽³²⁾ in the same Society above sixteen years, has favoured them with only two or three, within this period.

Had **Dr. Rittenhouse** enjoyed leisure to write, there are sufficient reasons to induce a belief, that his compositions would have been highly estimable; not solely for the subject matter of them, but for their manner also. It is true, he laboured under the privations of a liberal education : his style might therefore, perhaps, have been deficient in some of the ornamental appen-

(32) The appropriate location of "The American Philosophical Society" is the city of "Philadelphia," where their meetings must be held in conformity to their charter. Monticello, Mr. Jefferson's residence in Virginia, is situated at the distance of about two hundred and seventy miles from the capital of Pennsylvania.

dages of classical learning. Nevertheless, the native energy of his mind, the clearness of his perceptions, the accuracy with which he employed his reasoning faculties,—in fine, the very extraordinary intellectual powers he displayed, when they were directed to the attainment of any species of human knowledge;—these would, doubtless, have supplied him with those beauties of language, which are usually, as well as most readily, derived from academic instruction. And in addition to all these, the sublimity of the objects which he so ardently and frequently contemplated, could scarcely fail to have communicated to his literary productions a due portion of an elevated style, when treating on subjects of a corresponding character. Dr. Rush, in noticing the address delivered by Rittenhouse before the Philosophical Society in the year 1775, observes, that “the language of this Oration is simple, but” that “the sentiments contained in it are ingenious, original, and in some instances sublime:” in another place, the learned Eulogist styles it an “eloquent performance.” It is presumed, that these characteristic features of that little work are not unaptly applied; and it will be found, on perusal, to be also strongly tinctured, throughout, with a vein of exalted piety⁽³³⁾ and universal benevolence.

(33) It is difficult for a sound and contemplative mind to form any conception of the character of a philosopher, according to the true meaning of the term, more especially of an astronomer, of a man observant of the works of nature and acquainted with

Dr. Rittenhouse, by the vigour of his mind, by the transcendent powers of his genius, had surmounted

her laws; and yet wanting in a due sense of religion. And hence Dr. Young has declared, that—

“ An undevout Philosopher is mad.”

Instances, however, of this kind of mania, are known to have existed; produced by that presumptuous pride, which is too often engendered by a sophistication of true philosophy with the wild fantasies of some modern metaphysical sects, affecting extraordinary illumination. By thus engrafting a bad scion upon a good stock, pernicious fruit is propagated: or, to drop metaphorical allusions, by attempting to blend into one system, principles so discordant in their nature, as those of the experimental philosopher and the visionary theorist who deals in abstract speculations and reasonings *a priori*, the appropriate powers of the mind are weakened, while its moral faculty is at the same time, and by the same means, greatly deteriorated.

An extraordinary but deplorable instance of this kind was exhibited to the world by the justly celebrated astronomer Lalande, in his own conduct and character, towards the concluding part of a long life. These are so well portrayed in the very interesting *Letters on France and England*, published in *The American Review of History and Politicks*, that the writer of the present memoirs cannot forbear presenting to his reader the following extract from Letter III.

“ Lalande, if not the most profound and original, was certainly the most learned astronomer of France, and the principal benefactor of the science to which he was so passionately devoted. He was remarkable for the most egregious vanity, and for the broadest eccentricities of character, and almost equally eminent for the most noble virtues of the heart. By a very singular perversion of intellect, he became a professed atheist, about the commencement of the revolution; pronounced, in the year 1793, in the Pantheon, a discourse against the existence of a God, with the red cap upon his head; and displayed, on this subject, the most absolute insanity, during the rest of his life. This mon-

the disadvantages of a defective education, 'as some few other great men have done ; but it may be fairly

strenuous infatuation betrayed him into the most whimsical acts of extravagance, and particularly into the publication of a Dictionary of Atheists, in which he enregistered not only many of "the illustrious dead," but a great number of his cotemporaries, and among these, some of the principal dignitaries of the empire.

" This circumstance led to an occurrence in the Institute, which that body will not soon forget. At an extraordinary sitting of all the classes, convoked for the purpose, when Lalande was present, a letter from the Emperor was announced and read aloud, in which it was declared, that Mr. Lalande had fallen into a state of dotage, and was forbidden to publish, thereafter, any thing under his own name. The old astronomer rose very solemnly, bowed low, and replied, that he would certainly obey the orders of his majesty. His atheistical absurdities deserved, no doubt, to be repressed ; but, besides the singularity of this form of interdiction, there was an unnecessary degree of severity in it, as the end might have been attained without so public a humiliation. Lalande was notoriously superannuated, and not therefore a fit object for this species of punishment. Some consideration, moreover, was due to his many private virtues, to his rank in the scientific world, and to the large additions which he had made to the stock of human knowledge. His atheistical opinions arose, not from any moral depravity, but from a positive alienation of mind on religious topics. He was not the less conspicuous for the most disinterested generosity ; for warm feelings of humanity ; for the gentleness of his manners ; for the soundness of his opinions on questions of science, and for a certain magnanimity with regard to the merits of his rivals and detractors. The extravagance of his opinions and his manners during his dotage, rendered him an object of almost universal derision in Paris, and subjected him to the most cruel and indecent mockery. It became fashionable, even among those who had derived their knowledge from his lessons and experienced his bounty, to depreciate his merits both as an astronomer and as a man. Lalande had the misfortune of living to see a maxim verified in his own regard, which has been exemplified in every age and country, that

inferred from the nature of things, that, had not that privation existed in the case of our Philosopher, he would have shone with a still superior lustre, not merely as a man of science, but as a literary character. (33)

some disciples may become superiour to their masters: But he was, nevertheless, at all times among the luminaries of science; and to him astronomy was indebted for more substantial and unremitted services, than to any one of his cotemporaries."

This very Mr. Lalande, in the preface to the third edition of his inestimable work entitled *Astronomie*, published at Paris so late as the year 1792, shews, that astronomy furnishes most powerful proofs of the being of a God. Yet this same man, in one year after, when in his "dotage," with a mind enfeebled by age, and corrupted by the delusions of the new philosophy of his countrymen, became an object of "derision," and of "mockery," even among Frenchmen; for his absurdities, and his endeavours to set himself up as a champion of atheism! Is it necessary to furnish the rational part of mankind with a more striking, and at the same time a more lamentable proof, of the deleterious effects produced by those illusions, which, under the assumed name of "Philosophy," have been conjured up by some modern Theorists and Political Speculators? Certainly, it is not. The instance, here adduced, may stand as a monument of the folly and depravity of the Philosophy of the Gallican School.

(34) "If," (says a late anonymous writer,) "from the advantages of sound learning to the state, we turn to its influence on the characters of individuals, we will find its effects to be no less striking. We will find, that although, without much learning, man may become useful and respectable, yet that he cannot, without it, become polished, enlightened and great; he cannot ascend to that grade in the scale of his Creator's works, to which his powers are intended to exalt him. If to this rule, a Franklin, a Rittenhouse, and a Washington present exceptions, they are to regarded as mere exceptions, and therefore do not amount to an infraction of the rule. They were prodigies;

The Writer of these Memoirs sincerely regrets, that he differs very widely, indeed, on this head, from a gentleman who has, himself, been distinguished in the literary world by his learning, as well as by his genius and science. "In speaking of Mr. Rittenhouse," says his eloquent Eulogist, "it has been common to lament his want of what is called a liberal education."—"Were education what it should be, in our public seminaries," continues our ingenious Professor, "this would have been a misfortune; but conducted as it is at present, agreeably to the systems adopted in Europe in the fifteenth century, I am disposed to believe that his extensive knowledge, and splendid character, are to be ascribed chiefly to his having escaped the pernicious influence of monkish learning upon his mind, in early life. Had the usual forms of a public education in the United States been imposed upon him; instead of revolving through life in a planetary orbit, he would probably" says his Eulogist "have consumed the force of his genius by fluttering around the blaze of an evening taper: Rittenhouse the Philosopher, and one of the luminaries of the 18th century, might have spent his hours of study in composing syllogisms, or in measuring the feet of Greek and Latin poetry." In another part of his Eulogium, (wherein he notices some fine and benevolent reflections of Dr. Rittenhouse, arising from a

which necessarily implies a departure from, and an ascendancy over common principles." See an *Account of Dickinson College, Carlisle*, in the *Port Folio*, for March, 1811; supposed to be written by Professor Cooper.

contemplation of particular works of nature,) Dr. Rush addresses an invocation to that distinguished class of learned men, the clergy, in terms corresponding with his sentiments just quoted :—"If such," says he, "be the pious fruits of an attentive examination of the works of the Creator, cease, ye ministers of the gospel, to defeat the design of your benevolent labours, by interposing the common studies of the schools, between our globe and the minds of young people."⁽³⁵⁾

(35) Three years before Dr. Rush expressed these opinions, so generally unfavourable to classical learning and an academic education, he seems to have thought these necessary qualifications for a *physician* at least. In his Lecture on the Character of Dr. SYDENHAM, delivered in Dec. 1793, is this passage: "From the short records of his life, which have been published by the different editors of his works, it appears that his education in academical learning and medicine, was perfectly regular. He became a scholar at Oxford, and a doctor of medicine at the university of Cambridge. I mention these facts," adds our learned Professor, "in order to refute an opinion which has been introduced by some lazy and illiterate practitioners of physic, that he was indebted wholly to intuition for all his knowledge of medicine. Men may become wise and distinguished by meditation or observation, in the science of morals and religion; but education and study are absolutely necessary to constitute a great physician."

With all due deference to the abilities and judgment of the Professor, the Memorialist presumes, that if "education and study are absolutely necessary to constitute a great physician," they are equally requisite in the formation of a great astronomer: because a knowledge of geometry and optics can no more be attained by intuition, than that of anatomy and the *materia medica*; yet these sciences are, respectively, indispensable in the formation of the two characters, to which they severally relate.

If, indeed, the “monkish learning” of the fifteenth century was now taught among us; if “composing

Still, adds Dr. Rush, “It is true Dr. Sydenham did not adopt, or follow, the errors of the schools in which he had been educated; but, by knowing them thoroughly, he was able, more easily, to examine and refute them.” Here, then, is an admission, that even an intimate knowledge of such errors is eminently useful, by enabling a man of a sound and cultivated mind to refute them: for, the refutation of existing errors, affords a most important aid to the advancement of true science.

Sydenham, it appears, received his collegiate education at both the English universities. It may not therefore be improper, on this occasion, to introduce a quotation from an invaluable elementary work;* in order to shew, what was the opinion entertained by a learned and distinguished German, of the English Universities,—on the models of which, the higher seminaries of learning in the United States are formed. “Of all the Universities of Europe,” says Baron Bielfeld, “those of Oxford and Cambridge in England appear at present to approach the nearest to perfection: The great men they produce, are a better proof than any other argument.† We could wish,” adds this highly enlightened foreigner, “always to see an university a real city of learning, a place consecrated entirely to the muses and their disciples; that the Greek and Latin languages were there predominant; and that every thing were banished from thence, which could cause the least dissipation in those who devote themselves to letters.” “The man who confines himself to his closet,”—says our author, in another place,—“is but rarely visited by the sciences, the arts and the belles lettres: to ac-

* The Elements of Universal Erudition, containing an analytical abridgment of the Sciences, Polite Arts, and Belles Lettres; by Baron Bielfeld. In three 8vo. volumes; translated from a Berlin edition, by W. Hooper, M. D. and printed in London, in the year 1770.

† The three great Universities of England and Ireland enjoy the right, in addition to many other important privileges, of sending, each, two members to represent them in parliament. Would to heaven! that there were something like a representation of the interests of learning and science, in the legislative bodies of our own country.

sylogisms," and "measuring the feet of Greek and Latin poetry," were now the sole objects of scholastic instruction in this country; then might our learned Professor have anathematized, with good reason, the system of teaching in our Universities and Colleges. But it is well known, that the Aristotelian Philosophy, and what is denominated the Learning of the Schools, has been gradually declining in the European seminaries of learning, in the course of the last two centuries;⁽³⁶⁾ and more particularly so, in the great schools

quire their intimate acquaintance, he must seek them in those places where Minerva, Pallas, Apollo, and the Muses, have fixed their residence. Emulation, that strong impulse in the career of all our pursuits, should constantly attend the man of letters from his early youth to the last period of his life; in the school, at college, at the university, in those employments to which his knowledge may lead him, or in those academies of science to which he may be admitted. Emulation is an animating faculty, that results from society: and few there are, to whom nature has given a genius sufficiently strong to attain an extensive erudition in solitude; who are provided with wings that can bear them, without guides, without models, without companions or supports, to the lofty regions of the empyrean."

(36) Bacon (the celebrated Viscount of St. Albans and Baron of Verulam) published his great philosophical work, the *Novum Organum*, in the year 1620. The learned and sagacious professor Cooper remarks, that "Lord Bacon" (whom the honourable Mr. Walpole considers as the Prophet of the Arts, which NEWTON came to reveal,) "was the first among the moderns, who pointed out the way by which real knowledge was to be obtained, and turned the minds of the learned from playing tricks with syllogisms, and the legerdemain of words without ideas; and taught them to rest theory upon the basis of experiment alone." See the Introductory Lecture of Thomas Cooper, Esq. Professor of Chemistry at Carlisle College, Pennsylvania.

of Britain and Ireland : that the system of academic instruction, deduced from the visionary theories of the philosophers of antiquity, is there, as well as here, nearly, if not entirely exploded. It is true, the Greek and Latin tongues are yet taught with great assiduity and success, in the British Isles ; as they have hitherto been, among ourselves :⁽³⁷⁾ and it is confidently hoped, that those languages will long continue to be cultivated with unabated zeal, in this country ; whatever may be their fate on the European continent, where it is said they are rapidly declining, along with other branches of useful learning, and accompanied by an evident decay of many social refinements. Those languages are, in fact, valuable auxiliaries in the attainment of many branches of useful science, and have ever been consi-

(37) The Greek and Latin are called by way of pre-eminence, the learned languages. Baron Bielfeld enumerates the advantages resulting from a knowledge of the former ; among which he notices that important one, of its enabling us more readily and clearly to comprehend the meaning of that almost boundless list of terms in the arts and sciences, used in modern languages and styled technical, which are either altogether Grecian, or derived from that language. He then makes this remark : " From all that has been said, it is apparent how much utility attends the study of the Greek tongue ; and how much reason the English have, for applying themselves to it, from their early youth." " But," observes this learned and discriminating writer, " that which has given the Latin an advantage over the Greek itself, that has rendered it indispensable to every man of letters, and has made it the basis of erudition, is, that during the middle age, and in general in all modern times, the learned of all Europe have made it their common and universal language ; so that the Latin forms, if we may use the expression, the natural language of the sciences." *Elem. of Univ. Erud.*

dered the best *substratum* of polite learning and literary taste.

A man may, assuredly, be a profound astronomer; he may be eminently skilled in other branches of natural science, or in the doctrines of morals; he may be well versed in the polite arts; and yet may not understand either Greek or Latin. Nevertheless, an intimate and classical acquaintance with these languages cannot diminish the powers of his mind, or render him less capable of excelling in other departments of human knowledge. Bacon, Newton, Boyle, and Mac-lauren, with a multitude of others, the most distinguished for genius, science and learning, received an academical education; they were masters of the Greek and Latin languages; and were also instructed, without doubt, even in the formation of syllogisms:⁽³⁸⁾ yet

(38) Although Mr. T. Cooper (before quoted) admits, that the "strict adherence to the syllogistic mode of reasoning," that which he calls "playing tricks with syllogisms," together with "the legerdemain of words without ideas," was carried much too far by some late metaphysical writers of eminence; yet he is of opinion, that "in modern times, this invention of Aristotle is abandoned more than it deserves to be: For," continues Mr. Cooper, "no man can so skilfully analyse the argument of another, as one who is well acquainted with the rules of scholastic logic, and accustomed to apply them. Good reasoners there are and will be, who know nothing of these rules, but better reasoners who do."

Mr. Cooper doubts, whether metaphysical lectures should be delivered, at all, in colleges; but thinks, that if metaphysics were to be there taught, the writings of Beattie, Oswald and Gregory, would be unworthy of notice. Much as the Writer

these great men were not the less eminent as philosophers. It is to be presumed, that, while at their seve-

of these Memoirs respects the talents and ingenuity of the learned Professor of Chemistry, he can by no means concur in this opinion: and he regrets, that he feels himself obliged to differ still more widely, from a gentleman of such acknowledged abilities, respecting the propriety of his recommending to youth the study of the works of Hobbes, Leibnitz and Collins.

Now, what the complexion and tendency of the tenets of Hobbes, Leibnitz, and other philosophers of the same class are, may be learnt from the following passages, translated from a French work, entitled, "*De la Philosophie de la Nature, ou Traité de Morale pour l'Epece Humaine, tire de la Philosophie et fonde sur la Nature*;" a work which, though anonymous in respect to its author, had passed through three editions in the year 1777. The writer thus says:

"Of what importance to me are the names of Carneades, of Lysander, of Hobbes, and the author of *The System of Nature*, names unhappily celebrated, which the apostle of the moral indifference of human actions alleges in favour of this atrocious extravagance?" (the doctrines of Fatality, Moral Scepticism, &c.) "Carneades was an arrogant Pyrrhonian, who doubted of every thing, excepting the superiority of his own logic. Hobbes had the audacity to write a book against the everlasting truths of geometry. Lysander, the enemy of the liberty of Sparta, and the corrupter of the oracles of Delos and Ammon, was one of those spirits of spleen and filth, who strive to acquire a name by reducing wickedness to a system. As for the anonymous Writer, whose licentious pen vents so much blasphemy on Nature, in disavowing the existence of God, he has purchased the right to deny that of Morality. He is equally silly with Salmonius, in braving the thunderbolt destined to stifle the stings of conscience." Speaking of Leibnitz, in another place, this French Moralist observes, that "the Philosopher of Leipsick made of the soul a monad, and explained all the phænomena of its union with matter by a pre-established harmony. One portion of Europe believed him; because he set up a new system! and what is it but a metaphysical theory, without system?" And again:

ral schools and colleges, they were employed in acquiring the more solid and useful parts of learning; as well as the ornamental and polite. Both are taught in all the higher seminaries; and to the Universities of the United States, as well as of Europe, are attached Professorships⁽³⁹⁾ for such instruction.

The able and learned editor of "The American Review of History and Politics"⁽⁴⁰⁾ remarks, that, "for very obvious reasons it could not be expected, that Philology would be duly appreciated, or cultivated to any extent, by the American public in general. The state of society in this country, so admirable under many points of view, renders this impossible. We should not be surprised or discouraged at a general

"What names have we to oppose to those of Descartes, Leibnitz, Pascal and Malbranch? The suffrage of NEWTON, alone, is sufficient to crush their Materialism; if, in the humble materials for the examination of human reason, the suffrage of one great man is competent to balance a syllogism."

(39) The professorships, all well supported and endowed, which are established at Oxford and Cambridge, (and, probably, there are similar institutions in the universities of Scotland and Ireland,) are in the following departments of literature and science: viz. Divinity, Hebrew, Arabic, Greek, Modern Languages, History (general,) Modern History, Civil Law, Common Law, Physic, Anatomy, Botany, Chemistry, Natural Philosophy, Experimental Philosophy, Astronomy, Mathematics, Geometry, Moral Philosophy, Casuistry, Music.

(40) See the editorial review, in that work, of an "Historical Report upon the progress of History and ancient Literature, since the year 1789, and upon their actual condition," &c. vol. iii. No 1.

ignorance of, and an almost universal indifference about the learned languages: but this is not all; the public feeling is not confined to mere apathy: it borders on hostility. Numbers are not wanting, persons even of influence in the community, who industriously proclaim, not simply the utter insignificance, but the pernicious tendency of classical learning; and who would proscribe it as idle in itself, and as dangerous to republicanism. At the same time, our progress in this pursuit is far from being in a natural ratio with our advances in other respects. Philology is in fact, even worse than stationary among us; from what cause, whether from the influence of the extraordinary notions just mentioned, or from the absence of all external excitements, we will not now pretend to determine.”

Should these judicious remarks of the respectable Reviewer be considered as containing an indirect censure on such “persons of influence” as he may be supposed to allude to, who “proclaim” the “pernicious tendency of classical learning,—it is much to be lamented by the friends of literature and science, that there should be any just grounds for its support.

Dr. Rittenhouse understood the German⁽⁴¹⁾ and Low Dutch languages, well; and had acquired a sufficient

(41) In the year 1789, Dr. Rittenhouse translated from the German of Mr. Lessing, director of the theatre at Hamburg, a tragedy called *Lucia Samson*; which translation was printed.

knowledge of the French, to enable him to comprehend astronomical and other works written in that tongue. These acquisitions, it has been observed, “served the valuable purpose of conveying to him the discoveries of foreign nations, and thereby enabled him to prosecute his studies with more advantage in his native language.”⁽⁴²⁾

But these were not the whole of his philological attainments. By the dint of genius, and by that spirit of perseverance which he manifested in every thing he undertook, he overcame in a great degree the difficulties of the Latin tongue.⁽⁴³⁾ This he did for the

in the same year, by Mr. Charles Cist, of Philadelphia. In the preface to it, the translator says :—“This translation was attempted at the request of a friend; and the many virtuous sentiments and excellent lessons of morality it contains, will apologize for its being offered to the public. To young ladies it may afford useful instruction, and will, from the nature of the distress, be particularly useful to them: an elegant writer well acquainted with the human heart, has observed, that the affection of a father to his daughter unites extreme sensibility with the utmost delicacy; and this sentiment is, no doubt, in a great degree reciprocal.”

(42) See Dr. Rush’s Eulog. on Ritt.

(43) The memorialist undertakes to say, on the authority of his father (the late Rev. Mr. Barton,) that our philosopher was sufficiently well versed in the Latin, to have read Newton’s *Principia* in that language, besides studying it in his native tongue: and further, that, although he was very imperfectly acquainted with the grammatical construction of the Greek language, he had so far familiarized himself to a knowledge of its written characters and words, as enabled him to consult a lexicon; which he frequently did, for the purpose of ascertaining the

same valuable purpose that he had in view, in learning the German, Low Dutch and French.

The reading of our Philosopher was extensive. It embraced every department of polite literature, as well as many branches of what is called, by way of distinction, useful knowledge. He appears to have been more particularly attached to history, voyages and travels, and to the poetick muse:⁽⁴⁴⁾ but the drama, ingenious productions of the imagination, and other works of taste and fancy, likewise engaged a portion of his attention.⁽⁴⁵⁾ Dr. Rush asserts, that he had ear-

true etymology of many of those technical terms, derived from the Greek, that are in common use in our language, particularly in relation to his favourite sciences.

(44) In Hill's Life of Dr. Barrow, it is remarked, that this great Mathematician (as well as learned Divine) "was always addicted to poetry, and very much valued that part of it which consists of description." In like manner, Dr. Rittenhouse delighted in poetic effusions of genius and science. His Eulogist observes, that "the muse of Thomson charmed him most:" indeed, an astronomer, and a man of virtue and taste, could not but be charmed by the chaste and glowing descriptions of that fascinating poet, blended, as they are, with philosophical reflections. Our philosopher, however, greatly admired Milton also: so that these two celebrated votaries of the muses seemed to be his favourites. Why should not these partialities of Rittenhouse be noticed?—when similar observations have been made respecting the characters of other men, eminent in science; as, for example, that the favourite author of Erasmus and the younger Scaliger, was Terence, and that Grotius was an admirer of Terence, Lucan and Horace.

(45) *Nec lusisse pudet*, is an observation which has, in particular instances, been applied to the occasional conduct and dis-

ly and deeply studied most of the different systems of theology.⁽⁴⁶⁾ On this head, no further information can be given by the writer of these Memoirs : yet he thinks he has good reason for believing,—and such as are independent of Dr. Rittenhouse's known liberality, with respect to various modes of faith and worship,—that he never gave a very decided preference to any

position of some of the wisest, best, and even gravest characters. Dr. Warton, in remarking on this line of Mr. Pope, viz.

“Unthought-of frailties cheat us in the wise,”—

says; “Who could imagine that Locke was fond of romances; that Newton once studied astrology; that Dr. Clarke valued himself for his agility, and frequently amused himself, in a private room of his house, in leaping over the tables and chairs; and that our author himself (Mr Pope) was a great epicure.”

In our own country, the sage Franklin abounded in anecdote and humour, and thought it not unwise to recreate his mind, at times, with the game of chess: the conversation of Judge Hopkinson was replete with sprightly wit, and he admired well written novels of no immoral tendency; as did also the late Judge Wilson: the illustrious Washington, in his earlier years, enjoyed the pleasures of the festive board, in the society of men of understanding and worth: and no man delighted more in cheerful conversation, and in reading works of fancy and taste, than the philosophic Rittenhouse. The almost universal tendency, in persons of all classes, to an occasional playfulness of temper, even in cases which may sometimes be considered as bordering on weakness, has given the force of a maxim to the observation of the latinists—*Nemo omnibus horis sapit*. Indeed, as a biographer of the celebrated Dr. Clarke has remarked, “to be capable of drawing amusement from trivial circumstances, indicates a heart at ease, and may generally be regarded as the concomitant of virtue.”

(46) See Dr. Rush's Eulog. on Ritt.

one regular society of Christians, over others; he loved that sort of Christianity, which inculcates sound morals: his charity, in regard to theological opinions and other concerns of religion, was great; and he felt no disposition to observe any thing like a scrupulous adherence to such tenets or rites, as he deemed less essential to the well-being of mankind. It was, in fact, the liberal manner (and this alone) in which he sometimes expressed himself on subjects of this nature, influenced by sentiments of the purest benevolence, that induced some persons of more rigid principles, and perhaps less candour, to doubt the soundness of his faith in revealed religion: but the whole tenor of his life, and the religious sentiments he had publicly and repeatedly avowed, shew how ill-founded such suspicions were.⁽⁴⁷⁾ A mind so contemplative as his,

(47) Sir Isaac Newton, it is well known, was thoroughly persuaded of the Truth of Revelation: yet he did not escape the imputation of being an Arian, Mr. Whiston having represented him as such. It is equally a matter of notoriety, that similar opinions have prevailed respecting Dr. Rittenhouse's religious creed: nay, further, that doubts were entertained by some, whether he believed at all in the fundamental principles of the Christian religion. In one instance, indeed, a virulent party-writer* had the hardiness, one might say folly, to proclaim him an "Atheist!" The publication in which this false and shameful accusation was made, appeared about the time of Dr. Rittenhouse's death, and, it is believed, shortly after that event.

As a Biographer of such a man as Rittenhouse, the Author of these Memoirs would do great injustice to his memory, did he not lay before his readers, in a full and undisguised manner, that sort of testimony concerning our Philosopher's religious senti-

* Mr. William Cobbett.

so devoted to the pursuit of truth, so boundless in its views, and so ardently attached to virtue, would naturally lead him to an investigation of the principles of Christianity; and it is evident from some passages in his Oration, and also in his familiar letters to his friends, that he believed in the fundamental articles of the Christian faith,⁽⁴⁸⁾ however he may have doubted

ments, which it is presumed will eradicate every doubt or suspicion, that has heretofore existed in the minds of some, on the subject. He is aware of the influence, which the opinions of eminently wise and good men (or, of such sentiments as are sometimes attributed to them,) have, in their operation on society; and, in every point of view, he fully estimates the importance of representing them to the world, in a strict conformity to truth.

These considerations have induced the Memorialist to devote a larger portion of his work to an elucidation of Dr. Rittenhouse's real opinions on the all-important subject of Religion, than he should have thought proper, under other circumstances, to appropriate to that part of his character.

Under these impressions, then, the Memorialist could not think it consistent with his duty, to withhold from the public a letter addressed to him by the Rev. Mr. Cathcart, a clergyman of much respectability and pastor of a presbyterian congregation in the borough of York. This letter (which will be found in the Appendix) contains what may be fairly deemed conclusive evidence, even if such had been before wanting, that Dr. Rittenhouse was "a firm Believer in Christianity." Bishop White had communicated to the Memorialist, in conversation, the interesting facts stated in Mr. Cathcart's letter; the knowledge of which, the Bishop had derived, verbally, from that gentleman: his letter was written in answer to one which the Memorialist addressed to him, on the occasion, at the instance of the Right Rev. Prelate.

(48) "Astronomy, like the Christian religion, if you will allow me the comparison," said our Philosopher, "has a much

respecting some of the more abstract and less important tenets of the church.

As Dr. Rittenhouse never attached himself to the distinguishing dogmas of any one sect of Christians; so, on the authority of a letter addressed to the Memorialist by Mr. B. Rittenhouse, soon after his brother's decease, it may be asserted, that our Philosopher "was never joined in communion with any particular religious society; though he esteemed good men of all sects." In his youth, it is probable he was bred a Baptist; the sect to which his father (and, it is believed, his mother also,) belonged: at subsequent periods, he entertained favourable opinions of the church of England, and of the principles of the quakers (so call-

greater influence on our knowledge in general, and perhaps on our manners too, than is commonly imagined. Though but few men are its particular votaries, yet the light it affords is universally diffused among us; and it is difficult for us to divest ourselves of its influence so far, as to frame any competent idea of what would be our situation without it." See *Ritt. Orat.*

In another part of his Oration, is this passage: "Our Religion teaches us what Philosophy could not have taught: and we ought to admire, with reverence, the great things it has pleased Divine Providence to perform, beyond the ordinary course of nature, for man, who is, undoubtedly, the most noble inhabitant of this globe:" &c.

And in addition to these sentiments, uttered and published by our Philosopher himself, let the testimony of Dr. Rush, who had long and intimately known him, be quoted from the learned Professor's Eulogium. "He believed in the Christian Revelation," says the Doctor: and then subjoins, "Of this he gave many proofs; not only in the conformity of his life to the precepts of the Gospel, but in his letters and conversation."

lancholy letter from me at present. I should be glad of opportunities to receive letters from you, and to write to you oftener :—indeed, I am desirous of disclosing to you some of my most serious thoughts.” It can scarcely be doubted, from the complexion of this paragraph and the character of the person to whom our then young philosopher was writing, that these “ most serious thoughts,” which he wished so much to disclose to his clerical friend, related to some points in divinity. After subjoining, in the same letter, some reflexions, of such a cast as shew that his spirits were depressed by fatigue and indisposition, as was usually the case with him, he proceeded thus : “ I assure you, notwithstanding, I am no misanthrope ; but think good society one of the greatest blessings of life. Whatever is said of original sin, the depravity of our nature, and our propensity to all evil ; though men are said to be wolves to men ; yet, I think, I can see abundance of goodness in human nature, with which I am enamoured. I would sooner give up my interest in a future state, than be divested of humanity ;—I mean, that good-will which I have to the species, although one half of them are said to be fools, and almost the other half knaves. Indeed I am firmly persuaded that we are not at the disposal of a Being who has the least tincture of ill-nature, or requires any in us. You will laugh at this grave philosophy, or my writing to you on a subject you have thought of a thousand times. But, can any thing that is serious, be ridiculous ? Shall we suppose Gabriel smiling at Newton, for labouring

to demonstrate whether the earth moves or not, because the former plainly sees it move?"

This extract (the latter part of which constitutes a note to Dr. Rush's Eulogium,) expresses, in the concluding sentence, a beautiful and apt allusion, in reference to the subject. It likewise contains a finely-turned compliment to the superior knowledge he presumed Mr. Barton to possess, on theological subjects; without its seeming to have been intended, that it should comprehend himself also,—otherwise than as he might be considered, for a moment, to be personating that branch of science which he most assiduously cultivated. The compliment, so far as it appeared to apply to himself, was unquestionably due to him; but his modesty would have forbidden his using it, even to a brother-in-law, could he have imagined at the instant of penning it, that a portion of it might be referred to himself, personally.

The whole scope of the passage, just quoted, "shews," however, as his Eulogist has observed, "how early and deeply the principles of universal benevolence were fixed in his mind." And in his Oration, composed when he was in the full meridian of life, our Philosopher has plainly indicated, that the same philanthropic spirit, that species of benevolence which is the basis of true religion, and that warmed his youthful breast, continued to animate it with unabated fervency: "That Being," said he, "before whose piercing

eye all the intricate foldings and dark recesses of the human heart become expanded and illuminated, is my witness, with what sincerity, with what ardour, I wish for the happiness of the whole race of mankind; how much I admire that disposition of lands and seas, which affords a communication between distant regions, and a mutual exchange of benefits; how sincerely I approve of those social refinements which really add to our happiness, and induce us with gratitude to acknowledge our great Creator's goodness; how I delight in a participation of the discoveries made from time to time in nature's works, by our philosophic brethren in Europe."

In the opinion of our Philosopher, "every enlargement of our faculties, every new happiness conferred upon us, every step we advance towards the perfection of the Divinity, will very probably render us more and more sensible of his inexhaustible stores of communicable bliss, and of his inaccessible perfections."⁽⁵¹⁾ He supposed, that, even in this world, "wherein we are

(51) Dr. Rittenhouse had no more faith in the notion entertained by some visionary men, of the attainment of the perfection of virtue, in this life, than he had in the fantastic opinion, maintained also by some, of the perfectibility of human reason. He supposed that we are capable, by a progressive "enlargement of our faculties," to "advance towards the perfection of the Divinity;" not like those pretenders to philosophy, who, as Mr. Voltaire expresses it, "took it into their heads, by the example of Descartes, to put themselves into God's place, and create a world with a word!" Our philosopher knew, that pure virtue and perfect reason do not belong to human nature.

only permitted '*to look about us and to die,*' there is ample provision made for employing every faculty of the human mind; even allowing its powers to be constantly enlarged through an endless repetition of ages;" but admitting, at the same time, "that there is nothing in it capable of satisfying us."

Similar indications of his extensive benevolence, and of the high sense he entertained of the dignity of human nature, as well as of the attributes of the Deity, are found every where in his writings; and the "elegant and pious extract" (as it is termed by Dr. Rush, in his *Eulogium*,) from a letter to one of his friends, quoted in another place, affords a striking instance of the prevalence of that disposition in the towering mind of Rittenhouse.

If "he believed political, as well as moral, evil, to be intruders into the society of men,"⁽⁵²⁾ he was certainly too well acquainted with the moral constitution of man and the evident nature of humanity, to suppose, "that a time would come, when every part of our globe would echo back the heavenly proclamation of universal peace on earth and good will to man."⁽⁵³⁾ Possessing a most benevolent disposition, he did believe, "that a conduct in this life, depending on our choice, will stamp our characters for ages yet to come." He was so far from expecting any thing like perfectibility here,

(52) Dr. Rush's *Eulogium*.

(53) *Ibid*.

that he thought, that man as a free agent, in darkening his faculties by an unworthy application of them here on earth, might “degrade himself to some inferior rank of being,” hereafter; while, on the other hand, by “the exercise of virtue, and a rational employment of those talents we are entrusted with,”—“we shall, in a few years, be promoted to a more exalted rank among the creatures of God—have our understandings greatly enlarged—be enabled to follow Truth in all her labyrinths, with an higher relish and more facility; and thus lay the foundation for an eternal improvement in knowledge and happiness.” Our Philosopher acknowledged, that he was “not one of those sanguine spirits who seem to think, that, when the withered hand of death hath drawn up the curtain of eternity, almost all distance between the creature and the creator, between finite and infinite, will be annihilated :”⁽⁵⁴⁾ Yet, the Writer of these Memoirs has no hesitation in expressing an opinion, with which a long and intimate acquaintance with Dr. Rittenhouse has forcibly impressed his own mind; that this virtuous man was inclined to believe, or rather, actually did believe, (with the distinguished author of the Dissertation on the Prophecies,)⁽⁵⁵⁾ in a final restitution of all things to harmony and happiness in another state of existence.

(54) This quotation and the other passages, before which inverted commas are placed in the margin, in the two last paragraphs of the text, are extracted from Dr. Rittenhouse’s Oration.

(55) Dr. Thomas Newton, Bishop of Bristol.

The learned Eulogist of our Philosopher, whom his present biographer has already so often quoted with much interest and pleasure, (although he is, on some points, so unfortunate as to be compelled to dissent from him,) has remarked, that Dr. Rittenhouse "was well acquainted with practical metaphysics." He had, without doubt, attentively studied those branches, at least, of this science, which embrace moral philosophy, connected, as it is, with a rational system of natural religion: probably, too, he had investigated its more abstruse and less useful departments: and, perhaps, he had also directed his all-inquisitive mind, in some degree, to a contemplation of those mental vagaries of the modern philosophy, as it is termed, which neither subserve the purposes of ethics or of natural theology: a system, if it deserve that appellation, made up of such incongruous materials, such visionary notions, as by their falsity alone, independently of their mischievous operation in society, seem calculated to dishonour the name of philosophy, and to depreciate the highly meritorious services rendered to mankind by the votaries of true science. If, however, Dr. Rittenhouse ever did condescend to employ any considerable portion of his valuable time, in making himself acquainted with the delusive principles of this multifarious sect of pseudo-philosophers, it has been already manifested with what sentiments of disapprobation, if not of abhorrence, he regarded their doctrines.⁽⁵⁶⁾

(56) A late learned philosopher and eloquent divine, after adverting to the irrational and infatuated notions of men of the

It being presumed, therefore, that our Philosopher was, in the words of his Eulogist, "well acquainted with practical metaphysics," an inference may thence be fairly made, that, with respect to metaphysical deductions, "he could use them," as has been said of

class above referred to, contrasted with doctrines founded in truth, and the awful gloom, destitute of every ray of consolation, that must necessarily accompany their reflections upon their own principles, addresses to them this short but serious invocation: "When these things are fairly weighed, as in nature they exist, I call on you, nay I challenge you, ye boasting philosophers! to comfort yourselves, and be easy under your dreary doctrine, or notion of being safe after death, in a state of annihilation or future nothingness! I call on you, ye wise Illuminati! of upstart name, to weigh these things seriously; and try whether you can comfort yourselves, and remain easy, in considering, and striving to make others consider, Death, as only an "everlasting Sleep," from which they will never be awakened, nor their ashes disturbed!" See Sermon V. in *The Works of William Smith, D. D. late Provost of the College and Academy of Philadelphia*.

In no instance have the impious and absurd doctrines of the "Philosophists" and the "Illuminati," of our times, been carried to such a height of extravagance, as by the revolutionists of modern France. These infatuated people undertook, in the year 1793, to abolish by Law, a Futurity of Existence; having then decreed, that no such state existed! They also decreed, that in every cemetery there should be erected a figure representing Sleep, pointing towards the tombs; and this Sleep of Death, the decree declared to be eternal!! It is to this sort of wickedness and folly that an allusion is made, in the foregoing quotation; as well as in the following lines, copied from the *Pursuits of Literature*:

"Systems which laugh to scorn th'avenging rod,
And hurl defiance at the throne of God;
Shake pestilence abroad with madd'ning sweep,
And grant no pause—but everlasting Sleep!"

Maclaurin, "with as much subtlety and force as any man living; but"—also like that celebrated philosopher—"he chose rather, in his conversation as well as his writings, to bring the matter to a short issue, in his own way." Certain it is, however, that Dr. Rittenhouse reprobated, as did his eminent predecessor just named, that subtle, vague and inconclusive kind of ratiocination, the mode of reasoning, in matters of abstract science, from causes to effects,⁽⁵⁷⁾ which so

- (57) "Let others creep by timid steps, and slow,
On plain experience, lay foundations low;
By common sense, to common knowledge bred;
And lost to nature's cause through nature led:
All-seeing in thy mists, we want no guide,
Mother of Arrogance and source of pride!
We nobly take the high priori road,
And reason downward, till we doubt of God."

Pope's Dunciad, b. IV. l. 455.

The following observation, in the form of a note, is referred to, from the lines above quoted, in a work which contains that extract, viz. "Those, who, from the effects in this visible world, deduce the eternal power and Godhead of the first cause, though they cannot attain to an adequate idea of the Deity, yet discover so much of him, as enables them to see the end of their creation and the means of their happiness: whereas they who take "the high priori road," as Hobbes, Spinoza, Descartes, and some better reasoners, for one that goes right, ten lose themselves in "mists," or ramble after visions, which deprive them of all sight of their end, and mislead them in the choice of wrong means."

Mr. Pope had put the above poetical lines into the mouth of one of his Dunces, when addressing himself to the goddess Dullness. And as the great Dr. Samuel Clarke had previously endeavoured to shew,* that the Being of a God may be demon-

* In his work entitled, "A Discourse concerning the Being and Attributes of a God, the Obligations of Natural Religion, and the truth and certainty of the Christian Revelation; in answer to Mr. Hobbes, Spinoza, the Author of the Oracles of Reason, and other deniers of natural and revealed Religion."

much characterize that "cobweb philosophy,"⁽⁵⁸⁾ of which the mass of mere metaphysical systems is made up. Rittenhouse was a practical philosopher: he held in contempt the obscurity of mysticism, in every object of rational enquiry; viewing it as being, always, either the parent or the offspring of error. He loved "sober certainty,"⁽⁵⁹⁾ in philosophy; and therefore he pursued Truth, in all his scientific researches, in that practical and rational mode of philosophizing, which he deemed conformable to the nature of truth itself, and best adapted to the construction and faculties of the human mind.⁽⁶⁰⁾

What was the general bias of Dr. Rittenhouse's opinions on the subject of government, no one who

strated by arguments deduced *a priori*, the Doctor conceived himself to be struck at, among those "better reasoners" alluded to, in the note above mentioned.

(58) See Ritt. Orat.

(59) Ibid.

(60) "Other systems of Philosophy have ever found it necessary to conceal their weakness and inconsistency, under the veil of unintelligible terms and phrases, to which no two mortals, perhaps, ever affixed the same meaning. But the philosophy of Newton disdains to make use of such subterfuges; it is not reduced to the necessity of using them, because it pretends not to be of nature's privy council, or to have access to her most inscrutable mysteries; but, to attend carefully to her works, to discover the immediate causes of visible effects, to trace those causes to others more general and simple, advancing by slow and sure steps towards the Great First Cause of all things." Ritt. Orat.

knew him could doubt; and they are likewise deducible, not only from his writings, but from the uniform course of his public and official conduct. He was, in fact, from the dawn of the American controversy with the government of the mother-country to the year 1775, a whig, in his political principles. From the commencement of hostilities in that year, his feelings, as a native of America, prejudiced him strongly against the administration of the British government; and the prejudices thus imbibed, were transferred, soon after, from those men who administered that government—as well as their measures, to the nature and form of the government itself. And finally, on the establishment of the national independence of the United States, in 1776, his opinions settled down, very decidedly, in favour of the governmental system of a representative and elective republic.

But, until the arrival of that important epocha, when thirteen North-American colonies of Great Britain solemnly announced to the world their separation from the parent-state, Rittenhouse thought and acted, in relation to political affairs, pretty much as his countrymen did. “Previous to the American revolution,” as Ramsay the historian has remarked, “the inhabitants of the British colonies were universally loyal:” and another American writer⁽⁶¹⁾ of respectability has correspondently observed, that the proceedings of the first congress were “cool, deliberate and loyal, though

(61) Dr. Morse, the Geographer.

marked with unanimity and firmness." Indeed many months elapsed, after the appeal to arms was actually made, before the strong attachment to the mother-country, which the American colonists had always manifested, generally subsided. But, after the middle of the year 1775, "the prejudices in favour of a connexion with England and of the English constitution," (to use the words of Chief-Justice Marshall,⁽⁶²⁾) "gradually, but rapidly wore off; and were succeeded by republican principles, and wishes for independence."

Such then, it is confidently believed, was the progress of political sentiments in their operation upon the mind of Rittenhouse, in common with a large majority of the American people.

The information must therefore have been wholly erroneous, upon which Dr. Rush was induced to ground his assertion, that "the year of the declaration of Independence, which changed our royal governments into republics, produced no change in his (Rittenhouse's) political opinions,—for," continues the Doctor, "he had been educated a republican by his father." The very reason which the able and zealous Eulogist has here assigned for Dr. Rittenhouse's political principles having undergone no change in consequence of the American revolution, being predicated upon an assumed but mistaken fact, it serves to inva-

(62) See his *Life of George Washington*.

validate that allegation ; and it would never have been made, had not Dr. Rush been led into the error by misinformation on the subject. Because, those who were personally acquainted with our Philosopher's father, (Mr. Matthias Rittenhouse,) must well know, that the old gentleman was remarkable for his quiet, unoffending principles and conduct ; that he meddled very little, if at all, with public affairs ; and that, although a man of good judgment, he had never turned his attention to political controversies or speculations on the science of government. He was in truth a pious man, of great industry, plain manners and unambitious temper ; and he uniformly approved himself a peaceable and faithful subject of that monarchy under which he lived seventy-three years, until 1776. On the other hand, the theory of government was a subject upon which the son had, doubtless, thought and read much. It cannot, therefore, be reasonably concluded, that Dr. Rittenhouse was "educated a republican by his father."

It is asked : "How could he (Rittenhouse) behold the beauty and harmony of the universe as the result of universal and mutual dependance, and not admit that Heaven intended Rulers to be dependant upon those, for whose benefit, alone, all government should exist? To suppose the contrary," it is added, "would be to deny unity and system in the plans of the great Creator of all things."⁽⁶³⁾ But, with all due deference

(63) See the Eulogium on Rittenhouse.

to the genius and talents of the highly respectable gentleman here quoted, the writer cannot persuade himself, that our Astronomer could have drawn such inferences as the results of analogical reasoning, from the beauty and harmony of the Universe, as those which the foregoing extract would seem to impute to him. For, who are those, "for whose benefit, alone, all government should exist?" The People: And in such a republic as the United States—where there cannot exist, *constitutionally*, "a privileged order of men"—the Rulers are, surely, a part of the People. What, then, is the nature of this mutuality of dependence between Rulers and People? If government should exist for the benefit of the People, that is, all the members of the community, as most assuredly it ought to do; then it should be conducted for the benefit of the Rulers, as well as of those who are ruled; the former being a component part of the entire community, under the comprehensive denomination of the People. It is therefore conceived, that, on republican principles, the People and their Rulers cannot be so contradistinguished as separate bodies of men, as that the former, alone, should be dependant on the latter; but that there ought to be between them, as constituting jointly and collectively the People, that "mutual dependence," of which the ingenious Eulogist speaks: otherwise, a privileged order of men must be considered as actually existing among us. Yet, even in the monarchical republic of Great Britain,⁽⁶⁴⁾ the business

(64) The names ordinarily used to distinguish things, do not always truly denote the nature of the things they are designed

of government is not wholly "limited" to "a privileged order of men :"(65) One branch of the legislative body is popular ; and one branch, also, of the judicial department of that government, the institution of juries, is purely republican.

The learned professor, here referred to, is nevertheless an highly estimable citizen of the American Re-

to signify: and it is very evident, that any misapplication of a name, to which a specific meaning has been appropriated, cannot alter or otherwise affect the essence or inherent quality of the thing itself to which it is wrongly applied.

A nation may be a republic, notwithstanding its chief executive magistrate be denominated a king. A kingly government may be essentially republican, provided the people be governed by known laws, and their king be limited in his prerogative, by the constitution of the state; not such a monarch as is vested with uncontroled power. In this sense, the British government may, as some modern writers have shewn, be called a commonwealth, or republic: and under a similar impression, Sir Thomas Smith, even in the reign of so rigid a prince as Henry VIII. wrote his book *De Republicâ Anglicanâ*. The republic of Poland was long governed by elective kings; and Shakespeare, (nay, even the leveller Godwin,*) appears to have considered Monarch, King and President, as synonymous terms.

(65) "It belongs to monarchies," says Dr. Rush, "to limit the business of government to a privileged order of men." See *Eulog*.

* The Memorialist can truly say, with the author of the *Pursuits of Literature*:—"I have given some attention to Mr. Godwin's work on *Political Justice*, as conceiving it to be the code of improved modern ethics, morality, and legislation. I confess I looked not for the Republic of Plato, or even for the Oceana of Harrington; but for something different from them all. I looked, indeed, for a superstructure raised on the revolutionary ground of Equality, watered with the Guillotine; and such I found it." See *Pursuits of Literature*, Dial. the third, note p. of the seventh Lond. edit.

public, as his numerous and important public services fully evince. In his "Address to the People of the United States," published shortly before the sitting of the Federal Convention, he has pointed out two "errors or prejudices on the subject of government in America, which," as he very justly observes, "lead to the most dangerous consequences." The correctness of his sentiments on the subject of those errors, does him honour: such of his observations as are more particularly applicable to the present subject, are contained in the following passages.

"It is often said, that 'the sovereign power and all other power is seated in the people.' This idea is unhappily expressed. It should be—'all power is derived from the people.' They possess it only on the days of their elections. After this, it is the property of their Rulers; nor can they exercise or resume it, unless it is abused. It is of importance to circulate this idea, as it tends to order and good government." And again:

"The people of America have mistaken the meaning of the word Sovereignty: hence, each State pretends to be sovereign. In Europe, it is applied only to those states, which possess the power of making war and peace, of forming treaties, and the like. As this power belongs only to Congress, they are the only sovereign power in the United States."

The Memorialist is persuaded, that Dr. Rittenhouse would have fully concurred in this construction of the nature of sovereignty, in an elective government: and he has been the more diffuse on this subject, in order both to prevent and remove, as much as possible, any misconceptions respecting the political opinions of our Philosopher.

An unostentatious simplicity and strict integrity, with a due proportion of dignity and firmness, in the administration of the public affairs; a judicious economy, in the management and expenditure of the public revenues; a zealous attention to the public interests and the happiness of the people; a wise and faithful administration of justice among the various members of the community, without any invidious distinctions; a strict observance of good faith, in all relations with foreign states; a sincere attachment to peace with its concomitant blessings, and consequently, an abhorrence of unnecessary wars, whether provoked, or undertaken, by means of the cupidity or the ambition of rulers; these have been usually considered, in theory, as characteristics of republican governments. Greatly is it to be desired, that they may always prove to be so, in fact.

That both the Rittenhouses, father and son, should be attached to an order of things in the commonwealth, established and conducted on the principles just mentioned, may be readily conceived from a

knowledge of their characters. To a system of civil polity, productive of such substantial benefits to all those under its immediate operation, Dr. Rittenhouse would naturally have been inclined: his habits, manners and principles, would so dispose him. Hence, after having indulged, for a moment, the pleasing but fanciful hypothesis, that if the inhabitants of the other planets resemble man in their faculties and affections; if, like him, they were created liable to fall, though some of them might be presumed to retain their original rectitude; he proceeds with supposing, "that they are wise enough to govern themselves according to the dictates of that reason which God has given them, in such manner as to consult their own and each other's happiness, upon all occasions. But if, on the contrary," said he, "they have found it necessary to erect artificial fabrics of government, let us not suppose they have done it with so little skill, and at such an enormous expence, as to render them a misfortune, instead of a blessing. We will hope," continues the philanthropic Rittenhouse, "that their statesmen are patriots, and that their kings, if that order of beings has found admittance there, have the feelings of humanity." He next deploras, in terms which evince the strength of his feelings on the occasion, the folly as well as iniquity of holding the Africans in bondage among us; national rapacity; the scourges of war, then recently inflicted on the north of Europe; and, finally, he deprecates in very im-

pressive language, the inroads of "luxury, and her constant follower, tyranny."⁽⁶⁶⁾

Dr. Rittenhouse having entertained such sentiments as these, at the time he penned his Oration, and it will be recollected, that this was only two or three months before hostilities had actually taken place between Great-Britain and her North-American Colonies, he was naturally enough induced to believe, that many of the political evils which were, about that period, experienced in civil society by a large portion of mankind, arose from the nature of their respective governments. And, the principal states of Europe, with the exception of the Dutch commonwealth, were then governed under the monarchical form.

In the American continental colonies of Great-Britain, generally, it was the prevalent opinion of the people at the commencement of the revolution, that the grievances complained of by the colonists, originated, almost as a matter of necessity, from the monarchical spirit of the mother-country: consequently, many of those great public evils which sprung from the genius, habits and pursuits, of the people themselves, in the great monarchies of the old world, were generally attributed to some peculiar vices inherent in that species of government. It was the universality,

(66) See Ritt. Orat. before the Am. Philos. Soc. in 1775.

But some passages in his Oration plainly shew, that, as has been already observed, he had no faith in the perfectibility of human reason,⁽⁷⁰⁾ in this life. He was also too sound a philosopher not to know, that if, by the best rules of philosophical ratiocination, many well known phænomena in the natural world could not be reached, with respect to their nature and causes, in such manner as to render these susceptible of demonstrative proof,—nothing like certainty in the result, much less perfection, could be calculated on, in putting the theories of a science, such as government, to the test of experiment.

(70) About the middle of January, 1813, the Memorialist passed a very pleasant evening, in company with an agreeable party of friends, at the house of Dr. Rush. Among various subjects, which were then discussed with much ingenuity and good humour, Redhefer's pretended discovery of what is called the Perpetual Motion, a thing which had then, very recently, attracted a good deal of the public attention, was brought upon the tapes: when Dr. Rush, addressing himself to the Writer, who had just expressed his opinion decidedly against the projector's theory, as being utterly incompatible with established principles of physics and well-known laws of the material world, said quite emphatically; "Sir, I entirely agree with you: and let me observe, there are four things, concerning which I have always been completely sceptical, as I am sure your good uncle* also was; that is to say, the perfectibility of human reason; the possibility of transmuting base metals into silver and gold; a panacea, in the healing art; and a power, in any mortal, to give perpetuity of motion to matter." These were, substantially, the sentiments expressed by Dr. Rush, on the occasion; and the Writer believes he is pretty accurate in his recollection of the very words which the Doctor used.

* Dr. Rittenhouse.

If it be asked: 'Where are the *Works* of Rittenhouse?' a ready and satisfactory answer to the question is at hand. Although he published no ponderous volumes, he has left behind him great and honourable memorials of his genius, his science and his skill; such as will long remain, as Monuments of the extraordinary extent of his practical usefulness in his day, and of his well-earned fame. "He has not indeed made a world," as Mr. Jefferson, in speaking of his Orrery, emphatically expresses himself; "but he has, by imitation, approached nearer its Maker, than any man who has lived from the creation to this day."⁽⁷¹⁾ As long, too, as the geographical boundaries of Pennsylvania, connected in part with those of the neighbouring states, shall continue to define the respective jurisdictions of their local sovereignties and rights, considered as members of a great confederated nation; so long will they serve to distinguish the name of Rittenhouse.⁽⁷²⁾ Nay, some of the rivers and canals, even some principal roads, in the country of his nativity, bear testimony to his talents, his pub-

(71) See *Notes on Virginia*.

(72) All the boundary-lines, mentioned above, were determined by astronomical observations. The manner in which the work was performed, with an account of the instruments used on those occasions, will be found in the fourth volume of the Transactions of the American Philosophical Society. Some of Dr. Rittenhouse's associates, in those arduous undertakings, were men of high reputation in the same departments of science; but his talents were principally relied on.

higher estimation, nor more deservedly so, by these qualified to form a proper judgment of them, wherever his name was known; not excepting those of Newton himself. His celebrity was far from being confined within the limits of his native country: his Orrery, with the proceedings and results of the Observation of that phænomenon which so greatly interested the principal astronomers of both hemispheres, the Transit of Venus in 1769, had rendered him justly celebrated in Europe as well as America, as a philosopher of the highest grade, at the age of thirty-seven years.

The peculiar circumstances of his Life, which have been amply detailed in these Memoirs, were of such a nature as to preclude him, in a great measure, from opportunities of carrying on a correspondence with men of science and letters, abroad: the extremely delicate, and oftentimes infirm state of his general health, in addition to his numerous avocations, his long continued, various, and important employments in the public service, left him little leisure for literary pursuits of any kind. Indeed, nothing less than the wonderful energy of his mind, and his extraordinary industry, could have enabled him to write as much as he has done.⁽⁷⁷⁾

(77) Mr. Chief Justice Marshall makes an observation, in reference to General Washington, which applies with equal force to Dr Rittenhouse. "To estimate rightly his worth, we must contemplate his difficulties: we must examine the means placed in his hands, and the use he made of those means." Pref. to Marshall's *Life of Washington*.

Dr. Rittenhouse never attempted to amuse the world with any hypothetical system of philosophy, or with opinions, merely speculative, on any subject. The great objects of his pursuits, through life, were Certainty and Truth: hence, he never advanced an opinion, concerning any thing whatever, which he did not consider as being either susceptible of verification by experiment and the evidence of our senses, or, where the nature of the subject did not admit of such proof, capable of being tested by the soundest principles of human reason. Yet, though this profound investigator of nature viewed "sober certainty" as the great desideratum in philosophy, he was by no means a dogmatist; even with respect to that portion of natural science which is capable of demonstration. Notwithstanding the opinion he entertained of the vast extent to which the faculties of the mind may be enlarged by a proper improvement of them, he was fully aware that its powers are limited. Like his great predecessor, Maclaurin, "the farther he advanced in the knowledge of geometry and of nature, the greater his aversion grew to perfect systems, hypotheses, and dogmatizing: without peevishly despising the attainments we can arrive at, or the uses to which they serve, he saw there lay infinitely more beyond our reach." Like him, also, he considered "our highest discoveries as being but a dawn of knowledge, suited to our circumstances and wants in this life; which, however, we ought thankfully to acquiesce in, for the present, in hopes that it will be improved in a happier and more

perfect state."⁽⁷⁸⁾ Rittenhouse never supposed, that, (to use the words of Maclaurin's biographer⁽⁷⁹⁾), "be-

(78) Mr. Maclaurin having noticed that the Author of Nature has made it impossible for us to have any communication, from this earth, with the other great bodies of the universe, in our present state; and after remarking on some phænomena in the planetary system, makes the following just reflections, which correspond with those expressed by Dr. Rittenhouse, in the concluding pages of his Oration:—"From hence, as well as from the state of the moral world and many other considerations, we are induced to believe, that our present state would be very imperfect without a subsequent one; wherein our views of nature, and of its great Author, may be more clear and satisfactory. It does not appear to be suitable to the wisdom that shines throughout all nature, to suppose that we should see so far, and have our curiosity so much raised concerning the works of God, only to be disappointed in the end. As man is undoubtedly the chief being upon this globe, and this globe may be no less considerable, in the most valuable respects, than any other in the solar system, and this system, for ought we know, not inferior to any other in the universal system; so, if we should suppose man to perish, without ever arriving at a more complete knowledge of nature, than the very imperfect one he attains in his present state; by analogy, or parity of reason, we might conclude, that the like desires would be frustrated in the inhabitants of all the other planets and systems; and that the beautiful scheme of nature would never be unfolded, but in an exceedingly imperfect manner, to any of them. This, therefore, naturally leads us to consider our present state as only the dawn or beginning of our existence, and as a state of preparation or probation for farther advancement: which appears to have been the opinion of the most judicious philosophers of old. And whoever attentively considers the constitution of human nature, particularly the desires and passions of men, which appear greatly superior to their present objects, will easily be persuaded that man was designed for higher views than of this life. Surely, it is in His power to grant us a far greater improvement of the faculties we already possess, or even to endow us with new faculties, of which, at

cause demonstrative evidence is the most perfect, it should be—as, by some, it has been—taken for granted, there is no other.” On the contrary, our philosopher believed that there are many truths, natural as well as moral, which are beyond the reach of demonstration; consequently, not to be rejected, solely by reason of their insusceptibility of this kind of proof. Hence, in his Oration he says, “Our Religion teaches us what Philosophy could not have taught; and we ought to admire, with reverence, the great things it has pleased Divine Providence to perform, beyond the ordinary course of nature, for man, who is undoubtedly the most noble inhabitant of this globe. But,” continues this truly good man, “neither Religion nor Philosophy forbid us to believe, that infinite Wisdom and Power, prompted by infinite Goodness, may, throughout the vast extent of creation and duration, have frequently interposed in a manner quite incomprehensible to us, when it became necessary to the happiness of created beings of some other rank or degree.”

this time, we have no idea, for penetrating farther into the scheme of nature, and approaching nearer to Himself, the First and Supreme Cause.”

The striking coincidence of the foregoing sentiments, with those expressed by Dr. Rittenhouse; in addition to the sublimity of the conceptions; the cogency of the argument; and the weight of the concurring opinions of two so great astronomers and mathematicians, on a subject of such high importance to mankind; all plead an apology for the length of this extract, from Maclaurin's Account of Sir Isaac Newton's Philosophical Discoveries.

(79) Patrick Murdoch, M. A. F. R. S.

Such were the pious reflections of a Christian Philosopher; the sublime sentiments of an eminently distinguished Astronomer.

Should it be enquired : What was the system of Philosophy, to which Dr. Rittenhouse adhered? though such a question can scarcely be anticipated, after what has been already said ; the answer may be furnished in a few words : He was a thorough and zealous disciple of the Newtonian school. He early embraced, and perseveringly cultivated, “ the Philosophy of Newton;” which “ disdains to make use of subterfuges,” which “ is not reduced to the necessity of using them, because it pretends not to be of nature’s privy council;” while “ other systems of philosophy have ever found it necessary to conceal their weakness and inconsistency, under the veil of unintelligible terms and phrases, to which no two mortals perhaps ever affixed the same meaning.”⁽⁸⁰⁾

(80) The words between inverted commas, in the above paragraph, are quoted from Rittenhouse’s Oration.

Notwithstanding the fanciful theories introduced into physics by Descartes, concerning his *materia subtilis* and *vortices*, and his doctrine of a *plenum*, which were prostrated by the general adoption of the Newtonian system, the improvements that had been made in the mathematical sciences and some other branches of physics, by the Cartesian system, produced a great revolution in the species of philosophy which till then prevailed. The philosophy of Descartes, erroneous and defective as, in some particulars, it was found to be, triumphed, by its superior energy, over the crude and feeble systems of the schools. The peripatetic doctrines which had revived in Europe, after she emerged

With Newton, too, our Philosopher entertained the most exalted conceptions of the Deity. He did not imagine, as his illustrious predecessor was unjustly charged with having done, that infinite space is an attribute of the Deity; that He is present in all parts of space, by diffusion:⁽⁸¹⁾ but, like that great man, he did believe, that the Deity endures from eternity to eternity, and is present from infinity to infinity; yet that He is not eternity or infinity, space or duration. For, says Dr. Rittenhouse, "Nothing can better demon-

from the barbarism and gloom that succeeded the final declension of the Roman empire, continued from that period to be the prevailing philosophy; and tintured, also, the whole mass of the scholastic theology: but the systems of Descartes first dissipated most of the useless subtleties of the schoolmen; while the truths brought to light by the philosophy of Newton, still further exposed their absurdities. According to Dr. Reid (in his *Essays on the intellectual and active powers of Man*,) even the most useful and intelligible parts of the writings of Aristotle himself had, among them, become neglected; and philosophy was reduced to an art of speaking learnedly and disputing subtilly, without producing any invention of utility in the affairs of human life. "It was," to use the language of Dr. Reid, fruitful in words, but barren of works; and admirably contrived for drawing a veil over human ignorance, and putting a stop to the progress of knowledge, by filling men with a conceit that they knew every thing. It was very fruitful also in controversies; but, for the most part, they were controversies about words, or things above the reach of the human faculties."

(81) The celebrated Dr. Samuel Johnson has remarked, that "Leibnitz persisted in affirming that Newton called Space, *Censorium Numinis*, notwithstanding he was corrected, and desired to observe that Newton's words were, *QUASI Censorium Numinis*. See Boswell's *Journal of a Tour to the Hebrides*.

strate the immediate presence of the Deity in every part of space, whether vacant or occupied by matter, than Astronomy does. It was from an Astronomer St. Paul quoted that exalted expression, so often since repeated, "In God we live, and move, and have our being."⁽⁸²⁾

The terms of profound veneration, in which our Philosopher spoke, on all occasions, of the character of Newton, demonstrate most clearly his complete and undeviating attachment to the Principles of that astonishing man.⁽⁸³⁾ Indeed, he appears to have taken him as his model; and, certainly, he resembled him much, in many points of character. Parallels have often been drawn between distinguished men; and in comparatively a few instances, a strong resemblance has been discovered, in some prominent features of character, between two or more persons. Yet the infinite variety of talent, that appears throughout the human race; the almost incredible difference in the grades of intellectual endowment, distinguishing the sons of men from each other; and the adventitious circumstances

f (82) This concise, yet beautiful and expressive sentence, is contained in St. Paul's address to the Athenians, cited in the 17th chapter of the Acts of the Apostles.

(83) A strong proof of this veneration will be found in Dr. Rittenhouse's Oration, wherein he expresses himself in these remarkable words:—"It was, I make no doubt, by a particular appointment of Providence, that at this time the immortal Newton appeared."

peculiar to each individual, which either direct or controul his conduct, and seem to mark his destiny in life; all these, taken together, produce such an endless diversity of character in the species, as to render it impracticable, if not absolutely impossible, to find any two men who greatly resemble each other in many particulars.

There are, nevertheless, so many circumstances founded on natural causes, that indicate an extraordinary similitude in the genius, disposition and principles of Rittenhouse, and his great Prototype; so many, moreover, of a singular nature, connected with events purely adventitious, wherein the condition, occupations and pursuits of these philosophers, with other eventual relations depending wholly on accident, resembled each other; that an interesting parallel, between them, might be attempted with no inconsiderable share of success.

In the course of these Memoirs, the Biographer of RITTENHOUSE has endeavoured to furnish a faithful representation of the Philosopher and of the Man. He was desirous of delineating his true character, in both points of view; that the world may be enabled to make a just estimate of the genius, the principles, and the conduct of a person, so celebrated in name. But, in order that the more correct judgment might be formed of his virtues and talents, and of the services he has rendered to society, it became necessary to de-

scribe the sphere in which he moved; so far, at least, as to present to view occasional sketches of the complexion of the Times in which he lived, and of some of the more prominent Characters who were his compatriots. The Memorialist has therefore conveyed to the mind of his reader some idea of the moral, political, and literary state of society, more particularly in the country of our Philosopher's residence, within the same period. This rendered it proper to notice the rise, nature, and progress of certain Institutions, upon which science and the arts, with many of the benefits of civil polity, greatly depend; such as tend to diffuse useful knowledge throughout the community, to promote the general weal, and to meliorate the condition of the great family of mankind.

It has been already observed, that every individual in society is more or less closely connected with it, in various ways: and it is obvious, that an eminent citizen, one, especially, standing in relations of a public nature in the community of which he is a member, usually has his history and character so interwoven with those of his own times, that it is difficult to understand the former thoroughly, without possessing a competent knowledge of the latter. The Life of such a man as RITTENHOUSE could not, therefore, in many respects, be either well comprehended or duly estimated, unless there had been connected with it some account of men and things, to which his private pursuits and public employments were, directly or indirectly, related.

In whatever light, then, a retrospective view of Dr. RITTENHOUSE'S character may be taken, it will be found to present a model worthy of imitation. The mild and amiable virtues of domestic life, and similar dispositions in the intercourses of private society, decorated his whole deportment, as a man and as a citizen; the more stern qualities of the patriot equally distinguished him as the friend of his native country, in all his public relations; while the principles of genuine philanthropy impressed his heart with feelings of the most extended benevolence. In all these respects, nevertheless, some have equalled, though few, if any, have surpassed him. But when, united to virtues and dispositions, such as these, the powerful genius, the extensive philosophical talents and attainments, the self-acquired and extraordinary mechanical skill of Dr. RITTENHOUSE, shall also have been considered; it will be acknowledged, that the *Memoirs of his Life*, commemorate a Man truly great. They recal to his surviving countrymen, and to their posterity, a remembrance of his excellence and usefulness; presenting to them such a specimen of worth and abilities, as is highly deserving of being emulated. At the same time, they exhibit to the world a faithful portrait of a Man, whose character had early acquired the well-earned respect of the wise and good in other nations. During his life, the name of RITTENHOUSE received due homage from some of the most illustrious Philosophers of Europe. In his own country, that name cannot cease to be venerated, so long as genius,

science, and virtue, shall be held in the high estimation to which they are entitled.

It has been observed by a noble author⁽⁸⁴⁾ of the present day, "that the decline of public spirit in matters of Taste, is a certain indication of political decay." To whatever degree the justness of this observation may extend, it will apply still more forcibly to any country, wherein a disregard, consequently a declension of learning, science and moral virtue, is perceived. RITTENHOUSE lived in an eventful age. During a long period of his life, he witnessed a comparative simplicity of manners and much integrity of character, among his countrymen. He beheld a progressive course of useful knowledge, and an advance in those arts and refinements of polished society, which minister as well to the rational enjoyments as to the conveniences of human life ; and these he saw accompanied by almost every species of public improvements, promoted by the liberal spirit of the people and fostered by the benign genius of the government. Our Philosopher himself, one-and-twenty years before his death, in speaking of the rapid progress his countrymen had then made in almost every species of social refinements, made this remark : " We have made most surprising, I had almost said unnatural, advances towards the meridian of glory."⁽⁸⁵⁾ But this good man dread-

(84) Lord Strangford, in his *Remarks on the Life and Writings of Camoens*.

(85) See his Oration.

ed even at that time, what he always most earnestly deprecated, that **Luxury** would, ere long, follow in the train of an highly cultivated state of manners and too sumptuous a style of living : for, he considered an excess of such refinements as leading to that depravity of morals which often accompanies "**Luxury**," and, as he has expressed it, "**her constant follower, Tyranny.**"

The gloomy anticipations, which he sometimes entertained, of a future depression of the interests of learning in his native country, from such causes, he lived not to see realized. There is, indeed, ground on which a reasonable hope may be founded, that, notwithstanding the operation of some inauspicious circumstances, in these times, occasioned by the present distracted state of the political world, literature, science and the arts, will yet be successfully cultivated in the **United States of America**. **Dr. RITTENHOUSE** had the good fortune to live in an age when virtue and talents were honoured ; when abilities to serve the country, and an honest attachment to its best interests, were the surest passports to the public confidence and esteem. In the latter years of his life, it was a source of great gratification to him to know that his country was prosperous ; it being then in the full enjoyment of all the arts of peace, and other blessings of a well-ordered society. He was greatly respected and esteemed by his illustrious compatriot, **WASHINGTON** ; whose magnanimity taught him to spurn with disdain

all petty considerations, arising from such mere difference of opinion in the speculations of politics, as could neither undermine the principles of a Patriot, nor affect the fidelity of an honest Man. Very many distinguished men, besides, were his contemporaries; and by persons of this description, almost universally, as well as by all his countrymen of every class, to whom his person or character was known, he was held in the highest estimation: indeed, few men ever enjoyed a larger share of the public regard.

Some years after the decease of Dr. Rittenhouse, it was judged expedient to transfer his perishable remains from their first place of sepulture, to another: they were accordingly removed; and interred in the cemetery adjoining the Presbyterian church in Pine-street, Philadelphia, near the body of his son-in-law, Mr. Sergeant. The grave of the celebrated American Astronomer is enclosed, under a plain slab of marble, thus inscribed:

IN MEMORY OF
DAVID RITTENHOUSE,

BORN APRIL 8th, 1732,

DIED JUNE 26th, 1796;

AND

HANNAH RITTENHOUSE,

HIS WIFE,

Who died October 15th,

1799,

Aged 64 years.

But, although no costly tomb contains the ashes of this eminently-distinguished Man; although no sculptured cenotaph, in any part of his country, blazons his genius or records his fame; and notwithstanding the chisel of the statuary has never been employed in obedience to the public voice, to produce a permanent resemblance of his countenance and figure; yet a monument of more durable nature than any of these, consecrates his virtues, his talents, and his usefulness. A grateful remembrance of his modest worth is enshrined in the hearts of the wise and the good of his own age and country; and the name of DAVID RITTENHOUSE will be every where perpetuated with veneration and renown, among the sons of science and the benefactors of mankind.

APPENDIX.

AN ORATION,

DELIVERED FEBRUARY 24, 1775,

BEFORE

THE AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA,

FOR PROMOTING USEFUL KNOWLEDGE.

BY DAVID RITTENHOUSE, A. M.

MEMBER OF THE SAID SOCIETY.

(INSCRIBED)

TO the Delegates of the thirteen United Colonies, assembled in Congress, at Philadelphia, to whom the future liberties, and consequently the virtue, improvement in science and happiness, of America, are intrusted, the following Oration is inscribed and dedicated, by their most obedient and humble servant, the Author.

GENTLEMEN,

IT was not without being sensible how very unequal I am to the undertaking, that I first consented to comply with the request of several gentlemen for whom I have the highest esteem, and to solicit your attention on a subject which an able hand might indeed render both entertaining and instructive; I mean Astronomy. But the earnest desire I have to contribute something towards the improvement of Science in general, and particularly of Astronomy, in this my native country, joined with the fullest confidence that I shall be favoured with your most candid indulgence, however far I may fall short of doing justice to the noble subject, enables me cheerfully to take my turn as a member of the society, on this annual occasion.

The order I shall observe in the following discourse, is this : In the first place I shall give a very short account of the rise and progress of astronomy, then take notice of some of the most important discoveries that have been made in this science, and conclude with pointing out a few of its defects at the present time.

As, on this occasion, it is not necessary to treat my subject in a strictly scientific way, I shall hazard some conjectures of my own; which, if they have but novelty to recommend them, may perhaps be more acceptable than retailing the conjectures of others.

The first rise of astronomy, like the beginnings of other sciences, is lost in the obscurity of ancient times. Some have attributed its origin to that strong propensity mankind have discovered, in all ages, for prying into futurity; supposing that astronomy was cultivated only as subservient to judicial astrology. Others with more reason suppose astrology to have been the spurious offspring of astronomy; a supposition that does but add one more to the many instances of human depravity, which can convert the best things to the worst purposes.

The honour of first cultivating astronomy has been ascribed to the Chaldeans, the Egyptians, the Arabians, and likewise to the Chinese;* amongst whom, it is pretended, astronomical observations are to be found of almost as early a date as the flood. But little credit is given to these reports of the Jesuits, who it is thought were imposed on by the natives; or else perhaps from motives of vanity, they have departed a little from truth, in their accounts of a country and people among whom they were the chief European travellers.

Not to mention the prodigious number of years in which it is said the Chaldeans observed the heavens, I pass on to what carries the appearance of more probability;† the report that when

* The reader will find a very learned and interesting dissertation on the astronomy of these and other nations of antiquity, in Lalande's *Astronomie*, liv. ii. W. B.

† Our orator might well pause, without noticing more particularly the fabulous annals of the Chaldeans. They assigned to the reigns of their ten dynasties, 432 thousand years: and Lalande observes, that this number, 432, augmented by two or by four noughts, frequently occurs in antiquity. This prodigious number of years expresses, according to the notions of the inhabitants of India, the duration of the life of a symbolical cow: in the first age, this cow, serving as a vehicle for innocence and virtue, advances with a firm step upon the earth, supported by her four feet; in the second, or silver age, she becomes somewhat enfeebled, and walks on only three feet; during the brazen, or third age, she is reduced to the necessity of walking on two; finally, during the iron age, she drags herself along; and, after having lost, successively, all her legs, she recovers them in the succeeding period, all of them being reproduced in the same order.

Alexander took Babylon, astronomical observations for one thousand nine hundred years before that time were found there, and sent from thence to Aristotle. But we cannot suppose those observations to have been of much value; for we do not find that any use was ever after made of them.*

The Egyptians too, we are told, had observations of the stars for one thousand five hundred years before the Christian era.

The Bramins thus make up their fabulous chronological account of the age of the world; viz.

The duration of the first age,	. . .	1,728,000 years
The second	. . .	1,996,000 do.
The third	. . .	864,000 do.
The fourth will continue	. . .	432,000 do.
Making the total duration of the world	. . .	4,320,000 years.

Mr. Lalande remarks, that these four ages have a relation to the numbers 4,3,2,1, which seem to announce some other thing than an historical division. Therefore, to give this fabulous duration of the world some semblance of truth, Mr. Bailly† rejects, in the first place, the fourth age, of which, at present, (that is, when Lalande wrote,) only 4887 years have passed: the residue of this duration could not be considered by Bailly as any thing more than a reverie: and as for the three first ages, he takes the years for days; in order to shew, that, in reality, they reckoned by days, before they computed by solar years. By these means, Bailly has reduced the pretensions of the people of India to 12,000 years; and he identifies this calculation for the Indians with that of the Persians, who give, likewise, 12,000 years for the duration of the world. The accordance thus produced in the two chronologies, seemed to Bailly to strengthen the authenticity of the recital; and makes it appear, that these notions prevailed alike among the Egyptians and the Chinese.

Such are the data, such the calculations, and such the reasoning of Mr. Bailly, on this subject!

But, although Mr. Lalande has noticed the retrograde series of the progressive numbers (1,2,3,4, in the Asiatic account of the age of the world, a kind of mysterious constitution of the amount of the years, in the several ages which make up the entire sum of its duration, seems to have escaped the observation of that acute philosopher; and probably the same circumstance passed also unnoticed by Mr. Bailly: it may be considered as a species of chronological *abracadabra*, engendered in the prolific brain of some eastern philosopher: the following is the circumstance here meant. It will be perceived, in the first place, that the arrangement of the numerical figures, in making up the years allotted to the fourth age of the world, is apparently artificial, and therefore, probably, altogether arbitrary. It will then be seen, that the number of years in the third age is double the amount of those in the fourth; that those in the second is made up by adding together the years in the fourth and third ages; and, that those in the first age are constituted by an addition of the number of years in the fourth and second ages. This being the fact, it does not seem to bear out Mr. Bailly, in his hypothesis, and the calculations founded on it. W. B.

* Lalande observes that Mr. Bailly has gone back, in his astronomical researches, to the first traditions of an antediluvian people, among whom there remained scarcely any traces of such knowledge; and that he has presented us, in his work, with ingenious conjectures and probabilities; or, more properly, appearances of truth, ("vraisemblables,") written with many charms of extensive information. But, according to Mr. Lalande himself, all the ancient astronomy down to the time of Chiron, which was about fourteen centuries before the Christian era, may with probability be reduced to the examining of the rising of some stars at different times of the year, and the phases of the moon; since, long after that period, as this great astronomer remarks, the Chaldeans and Egyptians yet knew nothing of either the duration or the inequalities of the planetary movements. W. B.

† Mr. Bailly was the author of a *History of Ancient and modern Astronomy. His Essay on the Theory of Jupiter's Satellites*, which is said to be a valuable treatise, was published in the year 1766. Both works are in the French language, and were printed in France.

What they were, is not known; but probably the astronomy of those ages consisted in little more than remarks on the rising and setting of the fixed stars, as they were found to correspond with the seasons of the year;* and, perhaps, forming them into constellations. That this was done early, appears from the book of Job, which has by some been attributed to Moses, who is said to have been learned in the sciences of Egypt.† “Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion? Canst thou bring forth Mazzaroth in his season, or canst thou guide Arcturus with his sons?” Perhaps too, some account might be kept of eclipses of the sun and moon, as they happened, without pretending to predict them for the future. These eclipses are thought by some to have been foretold by the Jewish prophets in a supernatural way.

As to the Arabians, though some have supposed them the first inventors of astronomy, encouraged to contemplate the heavens by the happy temperature of their climate, and the serenity of their skies, which their manner of life must likewise have contributed to render more particularly the object of their attention; yet it is said, nothing of certainty can now be found to induce us to think they had any knowledge of this science amongst them before they learned it from the writings of Ptolemy, who flourished one hundred and forty years after the birth of Christ.

But notwithstanding the pretensions of other nations, since it was the Greeks who improved geometry, probably from its first rudiments, into a noble and most useful science; and since we cannot conceive that astronomy should make any considerable progress without geometry, it is to them we appear indebted for

* See the preceding note.

† Some of the constellations appear to have been named, even before the time of Moses, who was born 1571 years before Christ: but, probably, most of them received their names about the time of the Argonautic expedition, which took place in the year 1263, B. C.

Hesiod and Homer who were co-temporaries, or, at least, flourished nearly at the same time, that is to say, about nine centuries before the Christian era, mention several of the constellations; and, among the rest, the Bear and the Hyades: and it is noticed by Mr. Lalande, that La Condamine says the Indians on the river Amazons gave to the seven stars in the Hyades, the name of the Bull's-head, as we do; and that Father Lasiata tells us, the Iroquois called that assemblage of stars to which we give the name of the Bear, by the same name; and named the polar star “the star that does not move.”

There are interesting facts. There is not the least resemblance, whatever, in the two constellations which have been mentioned, to the animals whose names they bear. Is it not, then, a matter of great curiosity, as well as one which may prove important in its result, to enquire, why two great tribes of uncivilized men, (supposed, by some, to be aborigines,) in the northern and southern sections of the western hemisphere, should apply the same denominations to two assemblages of stars, by which those constellations were known to Hesiod and Homer, if not earlier, and at least twenty-five hundred years before? W. B.

the foundations of a science, that (to speak without a metaphor) has in latter ages reached the astonishingly distant heavens.

Amongst the Greeks, Hipparchus* deserves particular notice; by an improvement of whose labours Ptolemy formed that system of astronomy which appears to have been the only one studied for ages after, and particularly (as was said before) by the Arabians; who made some improvements of their own, and, if not the inventors, were at least the preservers of astronomy. For with them it took refuge, during those ages of ignorance which involved Europe, after an inundation of northern people had swallowed up the Roman empire; where the universally prevailing corruption of manners, and false taste, were become as unfavourable to the cause of science, as the ravages of the Barbarians themselves.

From this time, we meet with little account of astronomical learning in Europe† until Regiomontanus,‡ and some others, revived it in the fifteenth century; and soon afterwards appeared the celebrated Copernicus,§ whose vast genius, assisted by such lights as the remains of antiquity afforded him, explained the true system of the universe, as at present understood. To the objection of the Aristotelians, that the sun could not be the centre of

* Hipparchus (of Nicaea, in Bithynia,) was a very celebrated mathematician and astronomer of antiquity. Mr. Lalande styles him the most laborious and most intelligent astronomer of antiquity, of whom we have any record; and asserts, that the true astronomy which has come down to us, originated with him. He divided the heavens into forty-eight (some say forty-nine) constellations, and assigned names to the stars. He is also said to have determined latitude and longitude, and to have computed the latter from the Canaries; and he is supposed to be the first who, after Thales, calculated eclipses with some degree of accuracy; but he makes no mention of comets. Hipparchus died one hundred and twenty five years before the Christian era. W. B.

† Friar Bacon is said to have been almost the only astronomer of his age; he informs us that there were then but four persons in Europe who had made any considerable proficiency in the mathematics.

‡ Regiomontanus was born in the year 1436, at Königsberg, a town of Franconia, subject to the house of Saxe-Weimar. His real name was John Müller: but he assumed the name of Regiomontanus from that of the place of his nativity, which signifies *Rapetus Mons*.

This astronomer, who was greatly celebrated in his time, was the first, according to Lalande, who calculated good Almanacks; which he had composed for thirty successive years; viz. from 1476 to 1506. In these (which were all published at Nuremberg in 1474, two years before his death,) he announced the daily longitudes of the planets, their latitudes, their aspects, and foretold all the eclipses of the sun and moon; and these ephemerides were received with uncommon interest by all nations. After noticing these, Lalande mentions the ephemerides which are published annually at Bologna, Vienna, Berlin, and Milan; but he pronounces the *Nautical Almanack*, of London, to be the most perfect ephemeris that was ever published. Regiomontanus compiled several other works, which greatly promoted his reputation. He died in 1476, at the age of forty years.

W. B.

§ See some interesting particulars respecting this great man, in Lord Buchan's account of the Tomb of Copernicus, and in the note thereto, inserted in the Appendix. W. B.

the world, because all bodies tended to the earth, Copernicus replied, that probably there was nothing peculiar to the earth in this respect; that the parts of the sun, moon and stars, likewise tended to each other, and that their spherical figure was preserved amidst their various motions, by this power; an answer that will at this day be allowed to contain sound philosophy. And when it was further objected to him, that, according to his system, Venus and Mercury ought to appear horned like the moon, in particular situations; he answered as if inspired by the spirit of prophecy, and long before the invention of telescopes, by which alone his prediction could be verified, "That so they would one day be found to appear."

Next follows the noble Tycho,* who with great labour and perseverance, brought the art of observing the heavens to a degree of accuracy unknown to the ancients; though in theory he mangled the beautiful system of Copernicus. The whimsical Kepler, too, (whose fondness for analogies frequently led him astray, yet sometimes happily conducted him to important truths) did notable services to astronomy: and from his time down to the present, so many great men have appeared amongst the several nations of Europe, rivalling each other in the improvement of astronomy, that I should trespass on your patience were I to enumerate them. I shall therefore proceed to what I proposed in the second place, and take notice of some of the most important discoveries in this science.

Astronomy, like the Christian religion, if you will allow me the comparison, has a much greater influence on our knowledge in general, and perhaps on our manners too, than is commonly

* Tycho-Brahé, as Lalande remarks, was the first who, by the accuracy and the number of his observations, prepared the way for the renewal of astronomy. The theories, the tables, and the discoveries of Kepler, are founded on his observations; and Lalande thinks, that their names, after those of Hipparchus and Ptolemy, ought to be transmitted with immortal honour to posterity.

Tycho was born in the year 1546, at Kaudstorp in Scania in Denmark, of a noble family, which subsisted also in Sweden under the name of Brahé, and to which the marshal count Löwendahl was allied. He died in 1601, at the age of fifty-five years.

Frederick II. king of Denmark, gave to Tycho the little island of Huen, called in Latin *Fennia*, towards the Sound, and about ten leagues, northward, from Copenhagen: where that prince erected for him a castle, named Uraniberg, and an observatory attached to it, completely furnished with the best instruments. Yet only fifty-one years after the death of Tycho, Mr. Huet, whose curiosity led him to visit a place so celebrated, could find no vestige of the observatory. One solitary old man, who yet retained some recollection of it, told him, that the tempestuous winds to which they were subject along the Sound, had demolished it. Even the name of Tycho was then unknown in that savage island, as Mr. Lalande indignantly styles it: and Mr. Picard, who was sent by the French academy, in 1671, to ascertain the exact situation of the observatory, was obliged to have the earth dug away, in order to discover its foundation. W. B.

imagined. Though but few men are its particular votaries, yet the light it affords is universally diffused amongst us; and it is difficult for us to divest ourselves of its influence so far, as to frame any competent idea of what would be our situation without it.* Utterly ignorant of the heavens, our curiosity would be confined solely to the earth, which we should naturally suppose a vast extended plain; but whether of infinite extent or bounded, and if bounded, in what manner, would be questions admitting of a thousand conjectures, and none of them at all satisfactory.

The first discovery then, which paved the way for others more curious, seems to have been the circular figure of the earth, inferred from observing the meridian altitudes of the sun and stars to be different in distant places. This conclusion would probably not be immediately drawn, but the appearance accounted for, by the rectilinear motion of the traveller; and then a change in the apparent situations of the heavenly bodies would only argue their nearness to the earth: and thus would the observation contribute to establish error, instead of promoting truth, which has been the misfortune of many an experiment. It would require some skill in geometry, as well as practice in observing angles, to demonstrate the spherical figure of the earth from such observations.†

But this difficulty being surmounted, and the true figure of the earth discovered, a free space would now be granted for the sun,

* "Certain it is," says the learned and pious Dr. Samuel Clarke (in his *Discourse on the Evidences of Nat. and Rev. Religion*), "and this is a great deal to say, that the generality, even of the meanest and most vulgar and ignorant people," (among Christians,) "have truer and worthier notions of God, more just and right apprehensions concerning his attributes and perfections, a deeper sense of the difference of good and evil, a greater regard to moral obligations and to the plain and more necessary duties of life, and a more firm and universal expectation of a future state of rewards and punishments, than, in any heathen country, any considerable number of men were found to have had."

In like manner, Archdeacon Paley (in his *View of the Evidences of Christianity*) observes:—"Christianity, in every country in which it is professed, has obtained a sensible, although not a complete influence, upon the public judgment of morals. And this is very important. For without the occasional correction which public opinion receives, by referring to some fixed standard of morality, no man can foretell into what extravagances it might wander." "From the first general notification of Christianity to the present day," says the same ingenious writer, "there have been in every age many millions, whose names were never heard of, made better by it, not only in their conduct, but in their dispositions; and happier, not so much in their external circumstances, as in that which is *inter præcordia*, in that which alone deserves the name of happiness, the tranquillity and consolation of their thoughts. It has been since its commencement, the author of happiness and virtue to millions and millions of the human race." He then asks: "Who is there, that would not wish his son to be a Christian?" W. B.

† Some of the commentators inform us, that Mahomet taught that the earth is supported by the tip of the horn of a prodigious ox, who stands on a huge white stone; and that it is the little and almost unavoidable motions of this ox which produce earthquakes.

moon, and stars to perform their diurnal motions on all sides of it; unless perhaps at its extremities to the north and south; where something would be thought necessary to serve as an axis for the heavens to revolve on. This Mr. Crantz in his very entertaining history of Greenland informs us, is agreeable to the philosophy of that country, with this difference perhaps, that the high latitude of the Greenlander makes him conclude one pole only, necessary: He therefore supposes a vast mountain situate in the utmost extremity of Greenland, whose pointed apex supports the canopy of heaven, and whereon it revolves with but little friction.

A free space around the earth being granted, our infant astronomer would be at liberty to consider the diurnal motions of the stars as performed in intire circles, having one common axis of rotation. And by considering their daily anticipation in rising and setting, together with the sun's annual rising and falling in its noon day height, swiftest about the middle space, and stationary for some time when highest and lowest, he would be led to explain the whole by attributing a slow motion to the sun, contrary to the diurnal motion, along a great circle dividing the heavens into two equal parts, but obliquely situated with respect to the diurnal motion. By a like attention to the moon's progress the Zodiac would be formed, and divided into its several constellations or other convenient divisions.

The next step that astronomy advanced, I conceive, must have been in the discovery attributed to Pythagoras;* who it is said first found out that Hesperus and Phosphorus, or the Evening and Morning Star, were the same. The superior brightness of this planet, and the swiftness of its motion, probably first attracted the notice of the inquisitive: and one wandering star being discovered, more would naturally be looked for. The splendor of Jupiter, the very changeable appearance of Mars, and the glittering of Mercury by day light, would distinguish them. And

* Pythagoras, who was one of the most celebrated among the Greek philosophers, in the knowledge and study of the heavens, was born about 540 years before the Christian era. It is believed that he was the first who made mention of the obliquity of the ecliptic, and of the angle which this circle makes with the equator; although Pliny attributes this discovery to Anaximander, whose birth was seventy years earlier. Among the remarkable things which Pythagoras taught his disciples, was the doctrine that fire, or heat, occupied the centre of the world; it is supposed he meant to say, that the sun is placed in the centre of the planetary system, and that the earth revolves around him, like the other planets. He also maintained each star to be a world; and that these worlds were distributed in an ethereal space of infinite extent. W. B.

lastly, Saturn would be discovered by a close attention to the heavens. But how often would the curious eye be directed in vain, to the regions of the north and south, before there was reason to conclude that the orbits of all the planets lay nearly in the same plane; and that they had but narrow limits assigned them in the visible heavens.

From a careful attendance to those newly discovered celestial travellers, and their various motions, direct and retrograde, the great discovery arose, that the sun is the centre of their motions; and that by attributing a similar motion to the earth, and supposing the sun to be at rest, all the phænomena will be solved. Hence a hint was taken that opened a new and surprising scene. The earth might be similar to them in other respects. The planets too might be habitable worlds. One cannot help greatly admiring the sagacity of minds, that first formed conclusions so very far from being obvious; as well as the indefatigable industry of astronomers, who originally framed rules for predicting eclipses of sun and moon, which is said to have been done as early as the time of Thales;* and must have proved of singular service to emancipate mankind from a thousand superstitious fears and notions, which juggling impostors (the growth of all ages and countries) would not fail to turn to their own advantage.

For two or three centuries before and after the beginning of the Christian era, astronomy appears to have been held in considerable repute; yet very few discoveries of any consequence were made, during that period and many ages following.

* Thales, who died about five centuries and an half before the Christian era, in the ninety-sixth year of his age,† first taught the Greeks the cause of eclipses. He knew the spherical form of the earth; he distinguished the zones of the earth by the mean of the tropicks and the polar circles; and he treated of an oblique circle or zodiac, of a meridian which intersects all these circles in extending north and south, and of the magnitude of the apparent diameter of the sun.

Herodotus, Cicero, and Pliny, assert, as is noticed by Mr. Lalande, that Thales had predicted to the Ionians a total eclipse of the sun, which took place during the war between the Lydians and the Medes. But the manner in which Herodotus (who lived about one century, only, after the time of Thales) speaks of this prediction, is so vague, that one finds some difficulty in believing that it was a fact. If it were true, says Lalande, that Thales had actually foretold an eclipse of the sun, it could be no otherwise, than by means of the general period of eighteen years, of which he would have acquired a knowledge from the Egyptians or the Chaldeans: for the period had not yet arrived, when eclipses could be prognosticated by an exact calculation of the motion of the moon. W. B.

† But, according to Dufresnoy, he was born in the first year of the 36th Olympiad, and died the first year of the 83d, those periods corresponding, respectively, with the years 640 and 573, B. C.: and if so, he lived only sixty-eight years.

The ancients were not wanting in their endeavours to find out the true dimensions of the planetary system. They invented several very ingenious methods for the purpose ; but none of them were at all equal, in point of accuracy, to the difficulty of the problem. They were therefore obliged to rest satisfied with supposing the heavenly bodies much nearer to the earth than in fact they are, and consequently much less in proportion to it. Add to this, that having found the earth honoured with an attendant, while they could discover none belonging to any of the other planets, *they* supposed it of far greater importance in the Solar System than it appears to *us* to be : And the more praise is due to those few, who nevertheless conceived rightly of its relation to the whole.

Tycho took incredible pains to discover the parallax of Mars in opposition ; the very best thing he could have attempted in order to determine the distances and magnitudes of the sun and planets. But telescopes and micrometers were not yet invented ! so that not being able to conclude any thing satisfactory from his own observations, he left the sun's parallax as he found it settled by Ptolemy, about twenty times too great. And even after he had reduced to rule the refraction of the atmosphere, and applied it to astronomical observations, rather than shock his imagination by increasing the sun's distance, already too great for *his* hypothesis, he chose to attribute a greater refraction to the sun's light, than that of the stars, altogether contrary to reason ; that so an excess of parallax might be balanced by an excess of refraction. Thus when we willingly give room to one error, we run the risk of having a whole troop of its relations quartered upon us. But Kepler afterwards, on looking over Tycho's observations, found that he might safely reduce the sun's parallax to one minute ; which was no inconsiderable approach to the truth. Alhazen,* an Arabian, had some time before, discovered the refraction of light in passing through air ; of which the ancients seem to have been entirely ignorant. They were indeed very sensible of the errors it occasioned in their celestial

* Alhazen was one of the greatest of the Arabian astronomers. He went, about the year 1100, to Spain, where many of his nation had established themselves in the eighth century, and carried thither their knowledge of astronomy ; yet, from the year 800 down to about 1300, science remained shrouded with the darkest ignorance, throughout Europe.

Mr. Lalande observes, that the theory of Refractions is an important one, in astronomy ; although it was considered of little consequence until the time of Alhazen. W. R.

measures; but they, with great modesty, attributed them to the imperfections of their instruments or observations.

I must not omit, in honour of Tycho, to observe that he first proved, by accurate observations, that the comets are not meteors floating in our atmosphere, as Aristotle,* that tyrant in Philosophy, had determined them to be, but prodigious bodies at a vast distance from us in the planetary regions; a discovery the lateness of which we must regret, for if it had been made by the ancients, that part of Astronomy (and perhaps every other, in consequence of the superior attention paid to it), would have been in far greater perfection than it is at this day.

I had almost forgot to take notice of one important discovery made in the early times of Astronomy, the precession of the equinoxes. An ancient astronomer, called Timocharis, observed an appulse of the Moon to the Virgin's Spike, about 280 years before the birth of Christ. He thence took occasion to determine the place of this star, as accurately as possible; probably with a view of perfecting the lunar theory. About four hundred years afterwards, Ptolemy, comparing the place of the same star, as he then found it, with its situation determined by Timocharis,† concluded the precession to be at the rate of one degree in an hundred years; but later astronomers have found it swifter.

Whatever other purposes this great law may answer, it will produce an amazing change in the appearance of the heavens; and so contribute to that endless variety which obtains throughout the works of Nature. The seven stars that now adorn our winter skies, will take their turn to shine in summer. Sirius, that now shines with unrivalled lustre, amongst the gems of heaven, will sink below our horizon, and rise no more for very many ages! Orion too, will disappear, and no longer afford our posterity a glimpse of glories beyond the skies! glittering Capella, that now passes to the north of our zenith, will nearly de-

* Aristotle, as though he had been of the race of the Ottomans, thought he could not reign except he first killed all his brethren. Inasmuch as he never nameth or mentioneth an ancient author or opinion, but to confute or reprove. *Bacon. Advancement.*

† Timocharis of Alexandria endeavoured, with Aristillus, a philosopher of the same school, to determine the places of the different stars in the heavens, and to trace the course of the planets. Dr. Lempriere places him 294 years before Christ; and the Abbé Barthelemy has inserted his name in the list of illustrious men, who flourished in the fourth century before the Christian era: he probably lived some time after the commencement of that century. W. B.

scribe the equator:” And Lyra, one of the brightest* in the heavens, will become our Polar Star: Whilst the present Pole Star, on account of its humble appearance, shall pass unheeded; and all its long continued faithful services shall be forgotten! All these changes, and many others, will certainly follow from the precession of the equinoxes; the cause of which motion was so happily discovered and demonstrated by the immortal Newton: A portion of whose honors was nevertheless intercepted by the prior sagacity of Kepler, to whom I return.

Kepler’s love of harmony encouraged him to continue his pursuits, in spite of the most mortifying disappointments, until he discovered that admirable relation which subsists between the periodic times of the primary planets, and their distances from the sun; the squares of the former being as the cubes of the latter. This discovery was of great importance to the perfection of Astronomy; because the periods of the planets are more easily found by observation, and from them their several relative distances may be determined with great accuracy by this rule. He likewise found from observation, that the planets do not move in circles, but in ellipses, having the sun in one focus. But the causes lay hid from him, and it was left as the glory of Sir Isaac, to demonstrate that both these things must necessarily follow from one simple principle, which almost every thing in this science tends to prove does really obtain in Nature: I mean, that the planets are retained in their orbits by forces directed to the sun; which forces decrease as the squares of their distances encrease.

Kepler also discovered that the planets do not move equally in their orbits, but sometimes swifter, sometimes slower; and that not irregularly, but according to this certain rule; That in equal times, the areas described by lines drawn from the planet to the sun’s centre, are equal. This, Sir Isaac likewise demonstrated must follow, if the planet be retained in its orbit by forces directed to the sun, and varying with the distance in any manner whatsoever. These three discoveries of Kepler, afterwards demonstrated by Newton, are the foundation of all accuracy in astronomical calculations.†

* By its peculiar situation it will continue to do so for a long time.

† According to Lalande, Kepler was as celebrated in astronomy by the consequences he drew from the observations of Tycho Brahé, as the latter was for the immense mass of materials which he had prepared for him: and the Abbé Delaporte (in his *Voyageur François*) represents him as

We now come to that great discovery, which lay concealed from the most subtle and penetrating geniuses amongst mankind, until these latter ages; which so prodigiously enlarged the fields of astronomy, and with such rapidity handed down one curiosity after another, from the heavens to astonished mortals, that no one capable of raising his eyes and thoughts from the ground he trod on, could forbear turning his attention, in some degree, to the subject that engages us this evening.

Galileo, as he himself acknowledges, was not the first inventor of the telescope, but he was the first that knew how to make a proper use of it.* If we consider that convex and concave lenses had been in use for some centuries, we shall think it probable that several persons might have chanced to combine them together, so as to magnify *distant* objects; but that the small advantage apparently resulting from such a discovery,

precursor of Descartes in optics, of Newton in physics, and as a law-giver ("legislator") in astronomy.

John Kepler, for this was the name of that famous mathematician, was born at Wîel, in the duchy of Wirtemberg, in the year 1571; and the Abbé Delaporte says, his family was illustrious. He died at Rainbon, in 1630. W. B.

* The true invention of the telescope cannot be carried back to an earlier date than the beginning of the seventeenth century. Johannes Baptista Porta, a Neapolitan, in his *Natural Magic*, which was published in the year 1589, says, "*Si utramque (lentem concavam et convexam) rectè componere noveris, et longinqua et proxima majora et clara videbis*:" and he is said to have made a telescope, accordingly, about the year 1594. But Porta is represented as having made this discovery such as it was, by accident; and, as not well understanding the proper use of his own invention.

According to Baron Bielfeld,† however, telescopes were first constructed a long time after, in Holland; some say, by John Lipperheim, a spectacle-maker at Middelbourg in Zealand; others, by James Metius, brother to the celebrated professor Adrian Metius, of Franeker. Although the invention of this instrument, of indispensable use in astronomy, is sometimes attributed to the great Galileo, he has himself acknowledged, in his treatise, entitled *Nuncius Siderius*, that he took the hint from a report of a German having invented an instrument, by means of which, and with the assistance of certain glasses, distant objects might be distinguished as clearly as those that were near. This is precisely what Porta had mentioned in his book, in 1589; and therefore, if Galileo had not referred to a German, he might be supposed to have had in his view the Neapolitan's conception of a telescope, announced long before such an instrument was properly constructed.

Whatever may have been the merit of Porta's discovery, or the pretensions of Lipperheim, the spectacle-maker, and Metius, Peter Borel (in his treatise *De vero Telescopii Inventore*) is of the opinion that Zachariah Johnson, who, like Lipperheim, was a spectacle-maker, and in the same city, made this discovery by chance, about the year 1500; that Lipperheim imitated him, after making numerous experiments; and that he instructed Metius. There are others, who have been considered as having had some sort of claim to this important invention; among whom were a Mr. Digges, of England, and a M. Hardy, of France, both towards the commencement of the seventeenth century.

It is certain, however, that Galileo in Italy, (who died in 1642, aged seventy-eight years,) and, according to Bielfeld, Simon Marius in Germany, were the first that applied the telescope to the contemplation of celestial objects. W. B.

† *Elem. of Univ. Erud.* b. i. ch. 49.

either on account of the badness of the glasses or the unskillfulness of the person in whose hands they were, occasioned it to be neglected.

But Galileo, by great care in perfecting his telescope, and by applying a judicious eye, happily succeeded; and with a telescope magnifying but thirty times, discovered the moon to be a solid globe, diversified with prodigious mountains and vallies, like our earth; but without seas or atmosphere. The sun's bright disk, he found frequently shaded with spots, and by their apparent motions proved it to be the surface of a globe, revolving on its axis in about five and twenty days. This it seems was a mortifying discovery to the followers of Aristotle; who held the sun to be perfect without spot or blemish.* Some of them, it is said, insisted that it was but an illusion of the telescope and absolutely refused to look through one, lest the testimony of their senses should prove too powerful for their prejudices.

Galileo likewise discovered the four attendants of Jupiter, commonly called his satellites;† Which at first did not much please that great ornament of his age, the sagacious Kepler. For by this addition to the number of the planets, he found their Creator had not paid that veneration to certain mystical numbers and proportions, which he had imagined. Let us not blush at this remarkable instance of philosophical weakness, but admire the candour of the man who confessed it

Galileo not only discovered these moons of Jupiter, but suggested their use in determining the longitude of places on the earth; which has since been so happily put in practice, that Fontenelle does not hesitate to affirm, that they are of more use

* In treating of the astronomy of the Greeks, Lalande contents himself with barely introducing the name of Aristotle, among their philosophers; seeming to consider him as one who had done very little for astronomical science. This philosopher (who died in the sixty-third year of his age, and only 322 years B. C.) among his other doctrines, not only maintained the eternity of the world; but, that Providence did not extend itself to sublunary beings: and as to the immortality of the soul, it is uncertain whether he believed it or not. Bayle calls his logic and his natural philosophy, "the weakest of his works;" and says, further; "It will be an everlasting subject of wonder to persons who know what philosophy is, to find that Aristotle's authority was so much respected in the schools, for several ages, that, when a disputant quoted a passage from this philosopher, he who maintained the thesis durst not say, *Transeat*; but must either deny the passage or explain it in his own way." W. B.

† This discovery was made on the 8th of January, 1610. It was, as Mr. Vince observes, a very important one in its consequences; as it furnished a ready method of finding the longitude of places, by means of their eclipses. W. B.

to Geography and Navigation,* than our own moon. He discovered the phases of Mars and Venus; that the former appears sometimes round and sometimes gibbous, and that the latter puts on the shapes of our moon: And from this discovery, he proved to a demonstration, the truth of the Copernican System.† Nor did that wonderful ring, which surrounds Saturn's body, without touching it, and which we know nothing in nature similar to, escape his notice; though his telescope did not magnify sufficiently to give him a true idea of its figure.

Amongst the fixed stars too, Galileo pursued his enquiries. The Milky-Way, which had so greatly puzzled the ancient Philosophers, and which Aristotle imagined to be vapours risen to an extraordinary height, he found to consist of an innumerable multitude of small stars; whose light appears indistinct and confounded together to the naked eye. And in every part of the heavens, his telescope shewed him abundance of stars, not visible without it. In short, with such unabated ardour did this

* Although both Geography and Navigation have been wonderfully improved by the important discoveries made by the moderns in astronomy, they have, nevertheless, derived the most essential aid from the application of the Compass to their purposes.

The invention of this instrument, which is of indispensable utility, is almost universally ascribed to Flavio Gioia, a native of Amalfi in the kingdom of Naples. He is called, by some writers, Flavio de Meiff, (by which is meant, Flavio of Amalfi, this town being the place of his nativity;) and his invention of the Compass is placed in the year 1302. But it is affirmed by others, that Paulus Venetus brought the Compass first into Italy from China, in the year 1260. The Chinese Compass, however, whatever may be its antiquity, appears to have been a very imperfect instrument, compared with the modern Mariner's Compass; and, more especially, with the Azimuth Compass, as improved by Dr. Knight and Mr. Smeaton. The Chinese Compass, now used, is represented as being nothing more than a magnetic needle kept floating, by means of a piece of cork, on the surface of water, in a white china-ware vessel, divided at bottom into twenty-four points.

It is worthy of observation, that the French have laid claim to the invention of the Compass, upon no better foundation than the circumstance of a *fleur-de-lis* being always placed at the north point of the card; although it is known, that Gioia decorated the north end of the needle with that flower in compliment to his own sovereign, who bore it in his arms, as being descended from the royal house of France. "It hath been often," says Dr. Robertson,‡ "the fate of those illustrious benefactors of mankind, who have enriched science and improved the arts by their inventions, to derive more reputation than benefit from the happy efforts of their genius. But," continues this eminent historian, "the lot of Gioia has been still more cruel; through the inattention or ignorance of contemporary historians, he has been defrauded even of the fame to which he had such a just title. We receive from them no information with respect to his profession, his character, the precise time when he made this important discovery, and the accidents and enquiries which led to it: the knowledge of this event, though productive of greater effects than any recorded in the annals of the human race, is transmitted to us without any of those circumstances which can gratify the curiosity that it naturally awakens." W. B.

† Galileo Galilei was a strenuous defender of the system of Copernicus; for which he was condemned by the inquisition, in the year 1633, under Pope Urban VIII. This extraordinary man was a native of Florence, and born in 1564. He died in 1642, aged seventy-eight years.

W. B.

‡ Hist of America, vol. i. b. i.

great man range through the fields of Astronomy, that he seemed to leave nothing for others to glean after him.

Nevertheless, by prodigiously encreasing the magnifying powers of their telescopes, his followers made several great discoveries; some of which I shall briefly mention. Mercury was found to become bisected, and horned near its inferior conjunction, as well as Venus. Spots were discovered in Mars, and from their apparent motion, the time of his revolution on an axis nearly perpendicular to its orbit, was determined. A sort of belts or girdles, of a variable or fluctuating nature, were found to surround Jupiter, and likewise certain spots on his surface, whence he was concluded to make one revolution in about ten hours on his axis; which is likewise nearly perpendicular to his orbit. Five* moons or satellites were found to attend Saturn, which Galileo's telescope, on account of their prodigious distance, could not reach:† And the form of his ring was found to be a thin circular plane, so situated as not to be far from parallel to the plane of our equator; and always remaining parallel to itself. This ring, as well as Saturn, evidently derives its light from the sun, as appears by the shadows they mutually cast on each other.

Besides several other remarkable appearances, which Hugenius‡ discovered amongst the fixed stars, there is one in Orion's Sword, which, I will venture to say, whoever shall attentively view, with a good telescope and experienced eye, will not find his curiosity disappointed. "Seven small stars, (says he,) of which three are very close together, seemed to shine through a cloud, so that a space round them appeared much brighter than

* It has been since ascertained that Saturn has seven satellites, as is more particularly mentioned in the subsequent note. W. B.

† It was about six years after the delivery of this oration, (viz. on the 13th of March, 1781,) that Herschel discovered the Georgium Sidus. And nearly eight years and an half after this first discovery, he made two others: on the 28th of August, 1789, he was enabled to ascertain, by means of his telescope of forty feet focal length, that Saturn has a sixth satellite; and, on the 17th of September following, he found that he has a seventh. The same celebrated astronomer has since made several important discoveries. Thus, under the liberal patronage of his sovereign, has the great Herschel succeeded, by his extraordinary skill and industry in the making of very large *specula*, in constructing telescopes, which, in the words of the learned Mr. Vince, "have opened new views of the heavens, and penetrated into the depths of the universe; unfolding scenes which excite no less our wonder than our admiration."

Many important discoveries (some of which are noticed in the foregoing pages of these memoirs) have been made by other eminent astronomers, since the date of Dr. Rittenhouse's Oration; some of them, indeed, since his decease; among which are the discoveries of three new planets. W. B.

‡ The celebrated Huygens, who, in his Latin works, is styled *Hugenius*. W. B.

any other part of heaven, which being very serene and black looked here as if there was an opening, through which one had a prospect into a much brighter region." Here some have supposed old night to be entirely dispossessed, and that perpetual daylight shines amongst numberless worlds without interruption.

This is a short account of the discoveries made with the telescope. Well might Hugenius congratulate the age he lived in, on such a great acquisition of knowledge: And recollecting those great men, Copernicus, Regiomontanus, and Tycho, so lately excluded from it by death, what an immense treasure, says he, would they have given for it. Those ancient philosophers too, Pythagoras, Democritus, Anaxagoras, Philolaus, Plato, Hipparchus; would they not have travelled over all the countries of the world, for the sake of knowing such secrets of nature, and of enjoying such sights as these?

Thus have we seen the materials collected, which were to compose the magnificent edifice of astronomical Philosophy; collected, indeed, with infinite labour and industry, by a few volunteers in the service of human knowledge, and with an ardour not to be abated by the weaknesses of human nature, or the threatened loss of sight, one of the greatest of bodily misfortunes! It was now time for the great master-builder to appear, who was to rear up this whole splendid group of materials into due order and proportion. And it was, I make no doubt, by a particular appointment of Providence, that at this time the immortal Newton appeared. Much had been done preparatory to this great work by others, without which if he had succeeded, we should have been ready to pronounce him something more than human. The doctrine of atoms had been taught by some of the ancients. Kepler had suspected that the planets gravitated towards each other, particularly the earth and moon; and that their motion prevented their falling together: and Galileo first of all applied geometrical reasoning to the motion of projectiles. But the solid spheres of the ancients, or the vortices of Des Cartes,*

* Among the many eminent astronomers in the sixteenth and seventeenth centuries, mentioned by Mr. Lalande, in his *Astronomie*, with interesting particulars concerning most of them, the only notice he there takes of his ingenious countryman, who endeavoured to establish the theory of Vortices which he had projected, is in these words: "Descartes (René,) né en Touraine en 1596, mort à Stockholm en 1650. Sa vie a été écrite fort au long par Baillet, à Paris, 1691, in 4°." W. B.

were still found necessary to explain the planetary motions ; or if Kepler had discarded them, it was only to substitute something else in their stead, by no means sufficient to account for those grand movements of nature. It was Newton alone that extended the simple principle of gravity, under certain just regulations, and the laws of motion, whether rectilinear or circular, which constantly take place on the surface of this globe, throughout every part of the solar system ; and from thence, by the assistance of a sublime geometry, deduced the planetary motions, with the strictest conformity to nature and observation.

Other systems of Philosophy have been spun out of the fertile brain of some great genius or other ; and for want of a foundation in nature, have had their rise and fall, succeeding each other by turns. But this will be durable as science, and can never sink into neglect, until " universal darkness buries all."

Other systems of Philosophy have ever found it necessary to conceal their weakness, and inconsistency, under the veil of unintelligible terms* and phrases, to which no two mortals perhaps ever affixed the same meaning : But the Philosophy of Newton disdains to make use of such subterfuges ; it is not reduced to the necessity of using them, because it pretends not to be of nature's privy council, or to have free access to her most inscrutable mysteries ; but to attend carefully to her works, to discover the immediate causes of visible effects, to trace those causes to others more general and simple, advancing by slow and sure steps towards the great First Cause of all things.

And now the Astronomy of our planetary system seemed completed. The telescope had discovered all the globes whereof it is composed, at least as far as we yet know. Newton with more than mortal sagacity had discovered those laws by which all their various, yet regular, motions are governed, and reduced them to the most beautiful simplicity : laws to which not only their great and obvious variety of motions are conformable, but even their minute irregularities ; and not only planets but comets likewise. The busy mind of man, never satiated with

* The philosophy of Aristotle retained terms so very obscure, that it seems the Devil himself did not understand, or at least could not explain them ; otherwise we can hardly suppose, that, when the good patriarch of Venice had summoned his attendance for this very purpose, he would have been so rude as to put him off with an answer not only unintelligible but inarticulate. See *Bayle, in Art. Barbara.*

knowledge, now extended its views further, and made use of every expedient that suggested itself, to find the relation that this system of worlds bears to the whole visible creation. Instruments were made with all possible accuracy, and the most skilful observers applied themselves with great diligence to discover an annual parallax, from which the distances of the fixed stars would be known. They found unexpected irregularities, and might have been long perplexed with them to little purpose, had not Dr. Bradley happily accounted for them, by shewing that light from the heavenly bodies strikes the eye with a velocity and direction, compounded of the proper velocity and direction of *light*, and of the *eye*, as carried about with the earth in its orbit; compared to which, the diurnal motion and all other accidental motions of the eye, are quite inconsiderable. Thus, instead of what he aimed at, he discovered something still more curious, the real velocity of light, in a way entirely new and unthought of.

All Astronomical knowledge being conveyed to us from the remotest distances, by that subtle, swift and universal messenger of intelligence, LIGHT; it was natural for the curious to enquire into its properties, and particularly to endeavour to know with what velocity it proceeds, in its immeasurable journeys. Experimental Philosophy, accustomed to conquer every difficulty, undertook the arduous problem; but confessed herself unequal to the task.* Here, Astronomy itself revealed the secret; first in the discovery of Roemer, who found that the farther Jupiter is distant from us, the later the light of his satellites always reaches us; and afterwards in this of Dr. Bradley, informed us, that light proceeds from the sun to us in about eight minutes of time.†

* Alluding to the experiments made in France, for determining the velocity of light; which, though unsuccessful, discovered a noble philosophical spirit.

† This prodigious velocity of light can be no argument against its materiality, as will appear from the following considerations. The greatest velocity which we can communicate to any body, is that of a cannon-ball, impelled by gun-powder; this may be at the rate of about 30 miles in a minute of time. The planet Saturn moves about 360 miles in a minute, that is 18 times swifter than a cannon-ball; and the comet of 1680, in its perihelion, moved near 56.66 times swifter than Saturn, or 990.5 times swifter than a cannon-ball. Now these are material bodies, moving with very various, and all of them exceedingly great velocities; and no reason appears why the last mentioned velocity should be the utmost limit, beyond which nature cannot proceed; or that some other body may not move 7 or 8 hundred times swifter than a comet, as light is found to do.

That the different refrangibility of the rays of light, on which their colours depend, arises from their different velocities, seems so natural a conjecture, that it has perhaps occurred to

As the apparent motion of the fixed stars, arising from this cause, was observed to complete the intire circle of its changes in the space of a year, it was for some time supposed to arise from an annual parallax, notwithstanding its inconsistency in other respects with such a supposition. But this obstacle being removed, there followed the discovery of another apparent motion in the heavens, arising from the nutation of the earth's axis; the period whereof is about nineteen years. Had it not been so very different from the period of the former, the causes of both must have been almost inexplicable. This latter discovery is an instance of the superior advantages of accurate observation: For it was well known that such a nutation must take place from the principles of the Newtonian Philosophy; yet a celebrated astronomer had concluded from hypothetical reasoning, that its quantity must be perfectly insensible.

The way being cleared thus far, Dr. Bradley assures us, from his most accurate observations, that the annual parallax cannot exceed two seconds, he thinks not one; and we have the best reason to confide in his judgment and accuracy. From hence then we draw this amazing conclusion; that the diameter of the earth's orb bears no greater proportion to the distance of the stars which Bradley observed, than one second does to the radius; which is less than as one to 200,000. Prodigiously great as the distance of the fixed stars from our sun appears to be, and pro-

every one who has thought on this subject. To this there are three principal objections. The first is, that, according to this hypothesis, when the satellites of Jupiter are eclipsed, their colour ought to change, first to a green and then to a blue, before their light becomes extinct; which is contrary to experience. But this objection appears to me of no weight; for we do not lose sight of the satellite because there is no light coming from thence to the eye, but because there is not light enough to render it visible. Therefore at the time a satellite disappears, there is still light of all colours arriving at the eye: and though the blue light should predominate on account of its slower progress, yet the red may predominate on another account; for along the edge of Jupiter's shadow, as it passes over the satellite, a greater proportion of red light, than of blue, will be thrown by the refraction of Jupiter's atmosphere. The second objection is, that since the velocity of the earth in its orbit, causes an aberration of about 30 seconds in the place of a star, if the different colours of light depended on different velocities, the aberration of blue light ought proportionably to exceed that of red light, which would give such an oblong form to a fixed star as might be discovered with a good telescope. This objection is of no more force than the former. The effect ought indeed to follow, but not in a sensible quantity; for at the altitude of 70 degrees, the apparent place of a fixed star is likewise removed 30 seconds by refraction, and the very same separation of the rays must take place; yet this I think is not discoverable with the best telescope. Perhaps by uniting these two equal causes, which may be readily done, and thereby doubling the effect, it may become sensible.

The third objection arises from that curious discovery of Dollond, by which we are enabled so greatly to improve refracting telescopes. And this objection I shall for the present leave in its full force; as well against the above hypothesis, as against every other which I have seen for the same purpose.

bably their distances from each other are no less, the Newtonian Philosophy will furnish us with a reason for it: That the several systems may be sufficiently removed from each other's attraction, which we are very certain must require an immense distance; especially if we consider that the cometic part, of our system at least, appears to be the most considerable though so little known to us. The dimensions of the several parts of the planetary system, had been determined near the truth by the astronomers of the last age, from the parallax of Mars. But from that rare phenomenon the transit of Venus over the sun's disk, which has twice happened within a few years past, the sun's parallax is now known beyond dispute to be 8 seconds and an half, nearly; and consequently, the sun's distance almost 12,000 diameters of the earth.

If from the distances of the several planets, and their apparent diameters taken with that excellent instrument, the micrometer, we compare their several magnitudes, we shall find the Moon, Mercury, and Mars, to be much less than our Earth, Venus a little less, but Saturn many hundred times greater, and Jupiter above one thousand times. This prodigious globe, placed at such a vast distance from the other planets, that the force of its attraction might the less disturb their motions, is far more bulky and ponderous than all the other planets taken together. But even Jupiter, with all his fellows of our system, are as nothing compared to that amazing mass of matter the Sun. How much are we then indebted to Astronomy, for correcting our ideas of the visible creation! Wanting its instruction, we should infallibly have supposed the earth by far the most important body in the universe, both for magnitude and use. The sun and moon would have been thought two little bodies nearly equal in size, though different in lustre, created solely for the purpose of enlightening the earth; and the fixed stars, so many sparks of fire, placed in the concave vault of heaven, to adorn it, and afford us a glimmering light in the absence of the sun and moon.

But how does Astronomy change the scene!—Take the miser from the earth, if it be possible to disengage him; he whose nightly rest has been long broken by the loss of a single foot of it, useless perhaps to him; and remove him to the planet Mars, one of the least distant from us: Persuade the ambitious monarch to accompany him, who has sacrificed the lives of thou-

sands of his subjects to an imaginary property in certain small portions of the earth ; and now point it out to them, with all its kingdoms and wealth, a glittering star "close by the moon," the latter scarce visible and the former less bright than our Evening Star :—Would they not turn away their disgusted sight from it, as not thinking it worth their smallest attention, and look for consolation in the gloomy regions of Mars ?*

But dropping the company of all those, whether kings or misers, whose minds and bodies are equally affected by gravitation, let us proceed to the orb of Jupiter ; the Earth and all the inferior planets will vanish, lost in the sun's bright rays, and Saturn only remain : He too sometimes so diminished in lustre, as not to be easily discovered. But a new and beautiful system will arise. The four moons of Jupiter will become very conspicuous ; some of them perhaps appearing larger, others smaller than our moon ; and all of them performing their revolutions with incredible swiftness, and the most beautiful regularity :—varying their phases from full to new and from new to full, and frequently eclipsing the sun and each other, at least to the equatorial parts of Jupiter ; and almost in every revolution suffering eclipses themselves by falling into Jupiter's shadow ; excepting that the outermost will seem, like a traveller fond of the sun-beams, cautiously to avoid the shadow for whole years together. Since we are advanced so far, if not tired of the journey, let us proceed a step further ; it is but 400 millions of miles to the globe of Saturn. Here again all will be lost, but Jupiter itself. The Sun will put on something of a starlike appearance, but with excessive brightness. The five† satellites of Saturn will exhibit appearances similar to those of Jupiter, but they will very rarely eclipse the Sun, or suffer eclipses themselves. The particular phenomena of Saturn's ring, we cannot explain, unless we knew the time and plane of Saturn's revolution on his axis. But this we know, that it must sometimes appear, by night, like a prodigious luminous arch, almost equal to one quarter of the heavens ; and at other times, dark, so as to afford no light itself, but to intercept the light of every star beyond it, by night, and of the sun itself by day. And to conclude, if borne on the wings

* Mars appears to be surrounded by a very great and dense atmosphere.

† Dr. Herschel discovered, in the year 1789, (fourteen years after the delivery of this Oration) two other satellites of Saturn. These are the innermost of his (now) seven secondary planets.

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of a comet we should travel with it to the remotest part of its orbit ; our whole planetary system would disappear, and the sun become a star, only more refulgent than Sirius perhaps, because less distant.

The opinion of the earth's rotation on its axis was once violently opposed, from a notion of its dangerous tendency with respect to the interests of religion :* But, as truth is always consistent with itself, so many new proofs were furnished from time to time by new discoveries, that a mistaken interpretation of some passages in the bible was compelled to give way to the force of astronomical evidence. The doctrine of a plurality of worlds, is inseparable from the principles of Astronomy ; but this doctrine is still thought, by some pious persons, and by many more I fear, who do not deserve that title, to militate against the truths asserted by the Christian religion. If I may be allowed to glve my opinion on a matter of such importance, I must confess that I think upon a proper examination the apparent inconsistency will vanish. Our religion teaches us what philosophy could not have taught ; and we ought to admire with reverence the great things it has pleased divine Providence to perform, *beyond the ordinary course of Nature*, for man, who is undoubtedly the most noble inhabitant of this globe. But neither religion nor philosophy forbids us to believe that infinite wisdom and power, prompted by infinite goodness, may throughout the vast extent of creation and duration, have frequently interposed in a manner quite incomprehensible to us, when it became necessary to the happiness of created beings of some other rank or degree.

How far indeed the inhabitants of the other planets may resemble man, we cannot pretend to say. If like him they were created liable to fall, yet some, if not all of them, may still retain their original rectitude.‡ We will hope they do : the thought is comfortable.—Cease, Galileo, to improve thy optic tube : and thou, great Newton, forbear thy ardent search into the distant mysteries of nature : lest ye make unwelcome discoveries. Deprive us not of the pleasure of believing that yonder radiant orbs, traversing in silent majesty the ethereal regions, are the peace-

* In 745, Virgilius, bishop of Saltzburg, having publicly asserted in some of his sermons, that there were antipodes, he was charged with heresy, by Boniface, bishop of Mentz, and cited to appear before the Pope, who recommended the hearing of the cause to Utilo, King of Bohemia, and at the same time wrote to him in favour of Boniface. The event was, the bishop of Saltzburg lost his cause, and was condemned for heresy.

ful seats of innocence and bliss: where neither natural nor moral evil has ever yet intruded; where to enjoy with gratitude and adoration the creator's bounty, is the business of existence. If their inhabitants resemble man in their faculties and affections, let us suppose that they are wise enough to govern themselves according to the dictates of that reason their creator has given them, in such manner as to consult their own and each other's true happiness, on all occasions. But if, on the contrary, they have found it necessary to erect artificial fabrics of government, let us not suppose that they have done it with so little skill, and at such an enormous expence, as must render them a misfortune instead of a blessing. We will hope that their statesmen are patriots, and that their kings, if that order of beings has found admittance there, have the feelings of humanity.—Happy people! and perhaps more happy still, that all communication with us is denied. We have neither corrupted you with our vices, nor injured you by violence. None of your sons and daughters, degraded from their native dignity, have been doomed to endless slavery by us in America, merely because *their* bodies may be disposed to reflect or absorb the rays of light, in a way different from *ours*. Even you, inhabitants of the moon, situated in our very neighbourhood, are effectually secured, alike from the rapacious hand of the haughty Spaniard, and of the unfeeling British nabob. Even British thunder impelled by British thirst of gain, cannot reach you: And the utmost efforts of the mighty Frederick, that tyrant of the north and scourge of mankind, if aimed to disturb *your* peace, becomes inconceivably ridiculous and impotent.

Pardon these reflections; they rise not from the gloomy spirit of misanthropy. That being, before whose piercing eye all the intricate foldings and dark recesses of the human heart become expanded and illuminated, is my witness with what sincerity, with what ardor, I wish for the happiness of the whole race of mankind: how much I admire that disposition of lands and seas, which affords a communication between distant regions, and a mutual exchange of benefits:* how sincerely I approve

* It has been shewn, in a preceding note, how much the means of communicating between distant regions, separated by seas, were facilitated by the discovery and use of the Compass: but those means have been still further and very greatly improved, since the introduction of the use of the Quadrant at sea, especially that called Hadley's Quadrant.

The true inventor of the reflecting Quadrant was Dr. Robert Hook, a very ingenious English mathematician and philosopher, who died in the year 1702, at the age of sixty seven years. This

of those social refinements which really add to our happiness, and induce us with gratitude to acknowledge our great Creator's

instrument, now commonly styled *Hadley's*, was afterwards rendered much more complete than Dr. Hook's invention had made it, by Sir Isaac Newton: but our modern artists, more skilful than those of former times, as Mr. Lalande has observed, have profited of the ideas of the great Newton himself, on the subject; and among the later improvers of the Sea Quadrant, or Octant, is Mr. Hadley, whose name the instrument usually bears.

It would, however, be doing an act of injustice to the memory of an American who possessed an extraordinary genius, to omit, in the course of these memoirs, some notice of his merits in relation to this matter. Mr. Thomas Godfrey, a native of Pennsylvania, is said to have turned his attention to this subject, so early as the year 1730; and in the Transactions of the Royal Society of London, No. 435, will be found, an "*Account of Mr. Thomas Godfrey's Improvement of Davis's Quadrant transferred to the Mariner's Bow,*" drawn up by James Logan, Esq. formerly of Philadelphia, a gentleman of extensive learning, and a very eminent mathematician. Mr. Godfrey is stated to have "sent the instrument (which he had constructed) to be tried at sea by an acquaintance of his, an ingenious navigator, in a voyage to Jamaica, who shewed it to a captain of a ship there, just going for England; by which means, it came to the knowledge of Mr. Hadley, though perhaps without his being to d the name of the real inventor." [See *The American Magazine*, for July 1758.] In a letter, dated at Philadelphia the 25th of May, 1732, Mr. Logan, who very ably as well as meritoriously patronized Godfrey, communicated to the celebrated Dr. Edmund Halley a detailed account and description of the *improved Sea-Quadrant* constructed by that ingenious citizen of America, of which his patron confidently believed him to be the original inventor. On the 28th of June, 1734, a further account of Godfrey's invention was drawn up by Mr. Logan, and subscribed with his name; which, it is presumed, was also communicated to the Royal Society: and on the 9th of November, in the same year, Mr. Godfrey transmitted an account of it, draughted and signed by himself, to the same learned body. The whole of these interesting letters, with some accompanying observations on the subject, are published in the valuable *Magazine* just referred to, and in the one for the succeeding month.

In the Transactions of the Royal Society, for the months of October, November and December, 1734, No. 421, is contained a Proposal, by Dr. Edmund Halley, for finding the longitude at sea, within a degree or twenty leagues, &c. In the conclusion of this paper, Dr. Halley, in speaking of John Hadley, Esq. V.P.R.S. ("to whom," as he observes, "we are highly obliged for his having perfected and brought into common use the reflecting telescope,") says—He "has been pleased to communicate *his* most ingenious instrument for taking the angles *by reflection*," (referring, here, to the Philos. Trans. No. 420;) "it is more than probable that the same may be applied to taking angles *at sea*, with the desired accuracy."

In Mr. Logan's account of Mr. Godfrey's invention, dated June 28, 1734, he says: "Tis now four years since Thomas Godfrey hit on this improvement; for, his account of it, laid before the (Royal) Society last winter, in which he mentioned two years, was wrote in 1732; and in the same year, 1730, after he was satisfied in this, he applied himself to think of the other, viz. *the reflecting instrument, by speculums for a help in the case of longitude*, though 'tis also useful in taking altitudes: and one of these, as has been abundantly proved by the maker, and those who had it with them, was taken to sea and there used in observing the latitudes the winter of that year, and brought back again to Philadelphia before the end of February 1730—1, and was in my keeping some months immediately after."

In Mr. Logan's prior letter to Dr. Halley (dated May 25, 1732,) he says, that about eighteen months before, Godfrey told him, "he had for some time before been thinking of an instrument for taking the distances of stars by reflecting speculums, which he believed might be of service at sea;" and that, soon after, Godfrey shewed him an instrument, which he had procured to be made, for the purpose. Thus, the time to which Mr. Logan refers Godfrey's communication of his improvement to him, would make its date to be about the month of November, 1730.

In the Rev. Mr. Vince's great work, entitled, *A Complete System of Astronomy*, (and contained in "A Treatise on Practical Astronomy," at the end of the second volume of that work,) is an entire chapter on "*Hadley's Quadrant*;" giving a particular description of the instrument, with rules for the computations from the observations and illustrations of them by examples. In this Treatise, the author says, that the instrument took its name from the "inventor," John Hadley, Esq. and observes, that not only the science of navigation is greatly indebted to this "incompara-

goodness :—how I delight in a participation of the discoveries made from time to time in nature's works, by our Philosophic brethren in Europe.

But when I consider, that *luxury* and her constant follower *tyranny*, who have long since laid in the dust, never to rise again, the glories of Asia, are now advancing like a torrent irresistible, whose weight no human force can stem, and have nearly completed their conquest of Europe; luxury and tyranny, who by a vile affectation of virtues they know not, pretend at first to be the patrons of science and philosophy, but at length fail not effectually to destroy them; agitated I say by these reflections, I am ready to wish—vain wish! that nature would raise her everlasting bars between the new and old world; and make a voyage to Europe as impracticable as one to the moon. I confess indeed, that by our connections with Europe we have made most surprising, I had almost said unnatural, advances towards the meridian of glory; but by those connections too, in all probability, our fall will be premature. May the God of knowledge

ble instrument," but such are its various uses in astronomy, that it may not improperly be called "a portable observatory." Mr. Vince further observes, that in the year 1742, about ten years after Mr. Hadley's invention (for so he styles it) was published, a paper in Sir Isaac Newton's own handwriting was found among Dr. Halley's papers, after the Doctor's death, containing a figure and description of an instrument (referring to *Philos. Transactions*, No. 465.) not much different in its principle from this of Hadley. He adds, that as Dr. Halley was alive when Mr. Hadley's instrument was shewn to the Royal Society, and he took no notice of this paper of Sir Isaac Newton, it is probable he did not know there was such an one. In another part of his work (under the head of *The History of Astronomy*, vol. ii. p. 280.) Mr. Vince asserts, that the first person who formed the idea of making a Quadrant to take angles by reflection, was Robert Hook; and he was born in 1635. On the whole, however, the learned author draws this conclusion :—"Both Sir Isaac Newton and Mr. Hadley therefore seem entitled to this invention."

Mr. Lalande, speaking of this instrument, says : *Le Quartier de Reflexion, exécuté en 1731 par Hadley, a donné un moyen facile de mesurer les distances sur mer, à une minute près, aussi bien déterminer le lieu de la Lune en mer.*" See his *Astronomie*, vol. iii. p. 654.

From these facts, and a careful examination of the papers themselves, here quoted and referred to, the scientific reader will be enabled to decide upon the true merits of the controversy that has so long subsisted, concerning the respective claims of Godfrey and of Hadley, to the invention of the instrument that bears the name of the latter.

Before this subject is dismissed, however, it will not be deemed improper to add, that the late Dr. John Ewing communicated to the Am. Philosophical Society an account of an Improvement in the construction of (what he terms) "Godfrey's double reflecting Quadrant," which he had discovered in the spring or summer of the year 1767 : this will be found in the first volume of the Society's Transactions. In the conclusion of this communication, Dr. Ewing says :—"This improvement of an instrument, which was first invented and constructed by Mr. Godfrey of this city, and which I do not hesitate to call the most useful of all astronomical instruments that the world ever knew, I hope will make it still more serviceable to mankind."

This communication to the Society by Dr. Ewing, was made in the year 1770. In one concerning the comet of that year, and made by Dr. Rittenhouse about the same time, the instrument to which Dr. Ewing's improvement applies, is called Hadley's Quadrant : but perhaps Dr. Rittenhouse so named it, in conformity to common usage.

inspire us with wisdom to prevent it: let our harbours, our doors, our hearts, be shut against luxury. But I return to my subject, and will no longer indulge these melancholy thoughts.

Some have observed, that the wonderful discoveries of the microscope ought to go hand in hand with those of the telescope; lest whilst we contemplate the many instances of the wisdom and power of divine Providence, displayed in the great works of creation, we should be tempted to conclude that man, and other less important beings of this lower world, did not claim its attention. But I will venture to affirm, without at all derogating from the merits of those who have so greatly obliged the world with the success of their microscopical enquiries, that no such danger is to be apprehended. Nothing can better demonstrate the immediate presence of the Deity in every part of space, whether vacant or occupied by matter, than astronomy does. It was from an astronomer St. Paul quoted that exalted expression, so often since repeated; "*In God we live, and move, and have our being.*" His divine energy supports that universal *substratum* on which all corporal substances subsist, that the laws of motion are derived from, and that wings *light* with angelic swiftness.

If the time would permit, how agreeable the task to dwell on the praises of Astronomy: to consider its happy effects as a science, on the human mind. Let the sceptical writers forbear to lavish encomiums on their cobweb Philosophy, liable to be broken by the smallest incident in nature. They tell us it is of great service to mankind, in banishing bigotry and superstition from amongst us. Is not this effectually done by Astronomy? The direct tendency of this science is to dilate the heart with universal benevolence, and to enlarge its views. But then it does this without propagating a single point of doctrine contrary to common sense, or the most cultivated reason. It flatters no fashionable princely vice, or national depravity. It encourages not the libertine by relaxing any of the precepts of morality; nor does it attempt to undermine the foundations of religion. It denies none of those attributes, which the wisest and best of mankind, have in all ages ascribed to the Deity: Nor does it degrade the human mind from that dignity, which is ever necessary to make it contemplate itself with complacency. None of these things does Astronomy pretend to; and

if these things merit the aim of Philosophy, and the encouragement of a people, then let scepticism flourish, and Astronomy lie neglected; then let the names of Berkeley, and Hume, become immortal, and that of Newton be lost in oblivion.

I shall conclude this part of my discourse with the words of Dr. Barrow—It is to Astronomy we owe “that we comprehend the huge fabric of the universe, admire and contemplate the wonderful beauty of the divine workmanship, and so learn the invincible force and sagacity of our own minds, as to acknowledge the blessings of heaven with a pious affection.”

I now come, in the last place, to point out some of the defects of Astronomy at this day. Which I am induced to undertake by the hopes I entertain that some of those defects may be removed under the auspices of this society, and of you my fellow citizens, who have so zealously promoted its institution. “The advantages arising from Astronomy, the pleasure attending the study of it, the care with which it was cultivated by many great men among the ancients, and the extraordinary attention paid to it in Europe by the present age,” all contribute to recommend it to your protection, under which we have the best reason to expect that it will flourish.

The mildness of our climate and the serenity of our atmosphere, perhaps not inferior to that of Italy, and likewise our distant situation from the principal observatories in the world (whence many curious phenomena must be visible here that are not likely to be observed any where else) are so many circumstances greatly in our favour.

And I trust there will not be wanting men of genius, to arise in this new world, whose talents may be particularly adapted to astronomical enquiries. Indeed I am persuaded that nature is by no means so niggardly in producing them, as we are apt to imagine. Some are never tempted forth from obscurity, some are untimely snatched away by death, a striking instance whereof we have in Horrox; and many are accidentally led to other pursuits.

The Astronomy of comets is still in its infancy; not that the attention of the learned and ingenious has at all been wanting for more than a century past; but because it will necessarily require many ages to bring it to perfection. I wish we were in a condition to promote it in some degree, by carefully observing

such comets as may appear. As yet we scarce dare affirm that any one has or will return a second time. It has never, that I know of, been certainly proved by observation, that a comet has descended within a parabolic orbit, and until that is done we have only a coincidence of periods and orbits (none of which have been very precise) to depend on for their return. Far less are astronomers able to determine the changes that may, and probably do, happen in their orbits* and velocities in every period, so as to predict their nearer or more remote approach to the earth or any planet. Whether their business be to repair or destroy, whether they are worlds yet in formation or once habitable worlds in ruins; whether they are at present habitable and regular attendants of our Sun only, or whether they are the vast links that connect the distant parts of creation by surrounding more suns than one, we know not.

If we descend to the Planetary System, there are still many things wanting to compleat Astronomy.

The orbits of the primary planets have at one time been supposed moveable with various irregularities, at other times fixed and permanent. It seems now generally granted, that according to the theory of gravity they must change their situations; yet not long since, some great astronomers warmly contended that this change was altogether insensible.

According to the best tables we now have, the planes of the orbits of Jupiter, the Earth and Mercury are immoveable, though the orbits themselves have a progressive motion in their planes. On the contrary, the poles of the orbits of Saturn, Mars and Venus are supposed to revolve about the poles of the earth's orbit, with such velocities as at present nearly reconcile calculation to appearances. But there is good reason to apprehend that such a supposition is not true in fact, and a mistake in this matter will have some important consequences. More probable is it, that the poles of the orbits of all the planets, the earth not excepted, revolve about some common centre. The several quantities of these motions, I am confident, are to be had from observation, and not from theory alone. If such a motion of the earth's orbit be admitted, it will account for the diminution† of the ob-

* This I know has been pretended to. But it is easy to make geometrical conclusions come out as we would have them, when the data they are founded on, are so uncertain that we may chuse them as suits our purpose.

† This circumstance tends gradually to lessen the variety of the seasons.

liquity of the ecliptic, which seems now incontestible; and that in whatever manner we divide the forces producing such motion, amongst the two superior planets and Venus, or even amongst all of them. And I should suspect the further diminution of obliquity, from this cause, will amount to about one degree and an half.

But as Astronomy now stands, it seems doubtful whether this change is owing to a deviation in the diurnal or annual motion of the earth; which introduces a very disagreeable uncertainty in conclusions drawn from some nice and useful observations.

The Lunar Astronomy has been brought so much nearer to perfection, by the celebrated MAYER,* than could have been expected, that I shall mention no deficiency in it, but this. We do not certainly know whether that apparent acceleration of the moon's motion, which Mayer with other great astronomers has admitted, ought to be attributed to a real increase of velocity in the moon, or to a diminution of the earth's diurnal motion. If to the former, the destruction of this beautiful and stupendous fabric, may from thence be predicted with more certainty than from any other appearance in Nature: But if to the latter, it may be prettily accounted for, by Dr. Halley's ingenious hypotheses concerning the change of variation in the magnetical needle. The Doctor supposes the external crust or shell of the earth to contain a nucleus detached from it, and that the impulse which first caused the diurnal motion, was given to the external parts, and from thence in time communicated to the internal nucleus, by means of an intervening fluid; but not so as perfectly to equal the velocity of the superficial parts of the globe. Whence it will follow, that the external shell of the earth is still communicating motion to the internal parts, and losing motion itself proportionably. The diurnal motion must therefore become slower and slower, yet can never be retarded, by this cause, beyond certain limits; nor can we conceive that any inconvenience will follow.

There is another physical question relating to the moon, which to me appears extremely curious; it is this—Whence is it that

* This was Tobias Mayer, who was born at Marbach in the principality of Wurtemberg, in the year 1723; he rendered himself celebrated in astronomy, by having calculated the best tables of the moon, and by an excellent catalogue of stars. He died at Gottingen in 1762, at the age of thirty-nine years. W. B.

the moon always turns the same side to us? or, which is the same thing, How comes the moon's rotation on her axis, and her monthly revolution about the earth, to be performed in the same time? None I believe will suppose it to be accidental, nor will the astronomer be easily satisfied with a final cause. Was it not originally brought about by a natural cause which still subsists? Can the attraction of any foreign body change a rotatory motion into a libratory one, and a libratory motion into rest, in spaces so very free from all resistance as those wherein the planets move? There are other defects in Astronomy that are purely optical. Removing of those, depends on the further improvement of telescopes, or rather on the more judicious use of them, at times and places the most favourable.

In speaking of telescopic discoveries I purposely reserved those made on Venus for this place, because they are still uncertain. Burattini in Poland first discovered spots in Venus, then Cassini in Italy; and afterwards Bianchini got a sight of them. But from all their observations it is uncertain, whether Venus revolves on its axis once in 23 hours, or once in 24 days. Perhaps it does neither. Nor is their determination of the axis' situation much more satisfactory. These spots on Venus are not to be seen but through an excellent telescope and a pure atmosphere.

In the year 1672 and 1676 Cassini saw a small star near Venus, which he thought might be a satellite attending on her. It appeared to have the same phase with Venus. In 1740 Mr Short with a telescope of 16 inches saw a small star at the distance of ten minutes from Venus, which from its apparent shape he likewise thought might be a satellite. And in 1761 Mr. Montaigne, in France, saw what he took to be the satellite of Venus, on the 3d, 4th, 7th and 11th of May.* But whether Venus has a satellite or not, must still be left amongst the doubtful things of Astronomy.

The spots on the sun, and those on the surfaces of several planets, have been many years observed without our approaching any nearer towards discovering their nature and cause. Dr. Wilson of Glasgow, has lately succeeded in advancing one step

* It may happen that any of the planets, about the time they become stationary, shall describe a loop about some small fixed star, in such manner as might be easily mistaken for the star making part of a revolution about the planet. This I suspected to have been the case with the above observation of Montaigne. But the times set down do not confirm the suspicion.

at least, with respect to those of the sun. He has proved from observation that those spots are vast cavities, whose bottoms lie far below the general surface of the sun, and whose sloping sides form the border which we generally see surrounding them. If I should venture to add one conjecture of my own, to those of this ingenious gentleman, I would suppose that those prodigious cavities in the surface of the sun, some of them capable of containing half our earth, are not repeatedly formed by unaccountable explosions of a semifluid substance, but permanent and solid, like the cavities within the moon. And that it is the dark matter sometimes lodging in them, that distinguishes them, and is only accidental.

The diurnal rotations of Saturn and Mercury are yet unknown; but when further improvements shall be made in the art of using telescopes, this circumstance will hardly escape the vigilance of astronomers.

These are a few of the many things that are still left to the industry of the ingenious in this science.

But if all higher and more sublime discoveries are not reserved for us in a future and more perfect state; if Astronomy shall again break those limits that now seem to confine it, and expand freely in the superior celestial fields; what amazing discoveries may yet be made amongst the fixed stars! That grand phenomenon the Milky-Way seems to be the clue that will one day guide us. Millions of small stars compose it, and many more bright ones lie in and near it, than in other parts of heaven. Is not this a strong indication that this astonishing system of worlds beyond worlds innumerable, is not alike extended every way, but confined between two parallel planes, of *immeasurable*, though not *infinite* extent? Or rather, is not the Milky-Way a vein of a closer texture, running through this part of the material creation? Great things are sometimes best explained by small and small by great. Material substances, such as we daily handle, have been thought composed of impenetrable particles in actual contact: then again it has seemed necessary to suppose them at a distance from each other, and kept in their relative situations by *attraction* and *repulsion*. Many appearances require that those distances should be very great in proportion to the size of the particles. Hence some, with no small reason, have concluded that matter consists of indivisible points endued

with certain powers. Let us compare these smaller portions of it with that great aggregate of matter which is the object of Astronomy ; *Light* will then appear to have as free passage through a piece of glass, as the comets have in the planetary regions ; and several other new considerations will arise.

If instead of *descending* we *ascend* the scale. If we consider that infinite variety which obtains in those parts of nature with which we are most intimate : how one order of most curiously organized bodies, infinitely diversified in other respects, all agree in being fixed to the earth, and receiving nourishment from thence : how another order have spontaneous motion, and seek their food on different parts of the earth, whilst by gravity they are confined to its surface, but in other respects diversified like the former. How a *third* float in, and below the surface of, a dense fluid, of equal weight with their bodies, which would soon prove fatal to both the others : And a *fourth* consisting of a vast variety too, have this property in common, that by a peculiar mechanism of their bodies, they can soar to great heights above the earth, and quickly transport themselves to distant regions in a fluid so rare as to be scarcely sensible to us. But not to pursue this boundless subject any further, I say, when we consider this great variety so obvious on *our* globe, and ever connected by some degree of uniformity, we shall find sufficient reason to conclude, that the visible creation, consisting of revolving worlds and central suns, even including all those that are beyond the reach of human eye and telescope, is but an inconsiderable part of the whole. Many other and very various orders of things unknown to, and inconceivable by us, may, and probably do exist, in the unlimited regions of space. And all yonder stars innumerable, with their dependencies, may perhaps compose but the leaf of a flower in the Creator's garden, or a single pillar in the immense building of the Divine Architect.

Here is ample provision made for the all-grasping mind of man !

If it shall please that Almighty Power who hath placed us in a world, wherein we are only permitted "*to look about us and to die ;*" should it please him to indulge us with existence throughout that half of eternity which still remains unspent ; and to conduct us through the several stages of his works ; here is ample provision made for employing every faculty of the human

mind, even allowing its powers to be constantly enlarged through an endless repetition of ages. Let us not complain of the vanity of this world, that there is nothing in it capable of satisfying us : happy in those wants, happy in those restless desires, forever in succession to be gratified ; happy in a continual approach to the Deity.

I must confess that I am not one of those sanguine spirits who seem to think, that when the withered hand of death hath drawn up the curtain of eternity, almost all distance between the creature and creator, between finite and infinite, will be annihilated. Every enlargement of our faculties, every new happiness conferred upon us, every step we advance towards the perfection of the divinity, will very probably render us more and more sensible of his inexhaustible stores of communicable bliss, and of his inaccessible perfections.

Were we even assured that we shall perish like the flowers of the garden, how careful would a wise man be to preserve a good conscience, during the short period of his existence ; because by his very constitution, which he cannot alter, this is his pride and glory, and absolutely necessary to his present happiness ; because this would insure to him at the approach of death, the soothing reflection, that he was going to restore, pure and uncorrupted, that drop of divinity within him, to the original ocean from whence it was separated. How much more anxiously careful ought we to be, if we believe, as powerful arguments compel us to believe, that a conduct in this life depending on our own choice, will stamp our characters for ages yet to come. Who can endure the thought of darkening his faculties by an unworthy application of them here on earth, and degrading himself to some inferior rank of being, wherein he may find both his power and inclination to obtain wisdom and exercise virtue, exceedingly diminished ? On the other hand, if that humble admiration and gratitude, which sometimes rises in our minds when we contemplate the power, wisdom and goodness of the Deity, constitutes by far the most sublimely happy moments of our lives, and probably will forever continue to do so, there cannot be a stronger incitement to the exercise of virtue and a rational employment of those talents we are entrusted with, than to consider that by these means we shall in a few years be promoted to a more exalted rank amongst the creatures of God, have

our understandings greatly enlarged, be enabled to follow truth in all her labyrinths with a higher relish and more facility, and thus lay the foundation of an eternal improvement in knowledge and happiness.

[TRANSLATED FROM THE LATIN ORIGINAL.]

To the illustrious and celebrated Society of Sciences, at Philadelphia,

CHRISTIAN MAYER, Astronomer to the most serene Prince, the Elector Palatine, wisheth prosperity.

I have concluded on due reflection, that the opportunity of writing, afforded me by the eminent Mr. Ferdinando Farmer, ought the less to be neglected, as by this means I might make some small return for the honour which the illustrious Society conferred on me, when they enrolled me in the list of their members.

I learnt with great pleasure, by a work printed in Philadelphia, and transmitted to me about three years since, that even there Astronomy is cultivated. That book, together with my own astronomical papers, having been destroyed by an unfortunate fire about two years ago, I have been induced to address something to your illustrious Society, concerning some of my new discoveries in the heavens.

I occupy a new Observatory at Manheim, accommodated to all astronomical purposes: nor is it deficient in any of the most valuable London-made instruments. Among these, the one which principally excels, is a mural quadrant of brass, of eight feet radius, made by that celebrated artist Bird, in the year 1776; fitted with an achromatic telescope, and firmly affixed to a wall, in the meridian; which I use daily, when the weather permits. I observed, nearly two years since, that, among the fixed stars, many of them from the first to the sixth degree of magnitude, other small attendant stars (or satellites) were distinguishable: some of which, by reason of their steady and dim light, resemble an order of planets, while others do not exceed the smallness of the telescopic size. The circumstance which principally excited my surprize, is, that I found none of those little attendant stars, a very few only excepted, contained in any known cata-

logue ; although I could clearly discover that their use, for the purpose of determining the proper motion of the fixed stars, is very obvious. For where the difference of right ascension and declination, of a few seconds at most, is found between the brighter fixed star and its attendant, the lapse of time could scarcely give any other variation to the fixed star, than to its satellite : from what cause soever that variation may arise, whether from the precession of the equinoxes, the variation in the obliquity of the ecliptic, the deviation of the instrument, or from the aberration of light or the nutation, or from any other cause whatever, which may depend on the mutable state of the atmosphere or the latitude of places, the fact is evident, that every change of situation, observed, between the fixed star and its satellite, affords the most certain proof of its actual motion ; whether this be referred to the fixed star or its satellite.

I knew that Halley, the celebrated English astronomer, was the first, who, in the year 1719, from an actual comparison of Flamstead's observations with those of Ptolemy, respecting some few fixed stars, Syrius, Arcturus, and Aldebaran, discovered that these stars moved, with a motion peculiar to themselves : But I knew at the same time, that in Flamstead's *British Celestial History*, so long ago as the year 1690, the name of attendant (or satellite) was assumed by Flamstead ; when that great man had not even thought of the proper motion of the fixed stars.

Other astronomers, since the time of Halley, so far as they examined the proper motion of the fixed stars, have followed the Halleian method, in a comparison of their own observations with those of the ancients. This method requires long and laborious calculations ; and continues liable to many doubts, on account of its uncertainty, as well by reason of the inaccurate nature of the instruments, as of the observations of the ancients. But this is not the case with my new method ; from which, by means of the variation observed between the satellite and its brighter fixed star, it necessarily results, that the appropriate motion, either of the one star or the other, is to be attributed to it. Hence it is, that, within two years past, I have observed almost two hundred attendants of divers fixed stars ; moving nearly in the same parallel, immediately before or after their respective fixed stars : and I have communicated many observations of this kind to the celebrated English astronomer, Nevil

Maskelyne, who assures me they prove highly acceptable to him.

From amongst many of my observations, I transmit to your illustrious society a few, by way of specimen; the corresponding observations to which, I find in the *Britannic Celestial History* of Flamsteed; whence at the same time it is obvious, that observations of this kind are eminently useful, for the purpose of discovering the proper motion of such stars.

[The Table, containing the Observations here referred to, will be found in the second volume of the Society's Transactions, annexed to Mr. Mayer's communication: he then proceeds thus, referring to that Table.]

The first and second left-hand column of the following Table are easily understood, from the title. The third column shews the difference of right ascension, in mean time, between the star and its satellite: The attendant, preceding the fixed star, is set down in the first place, in the table; the attendant, following, is placed after its fixed star. The fourth column notes the difference between the fixed star and its attendant, as I have observed it at Mannheim. The letter A denotes, that the attendant is to the southward; letter B more northward. The following columns contain the observations of the same star, made by Flamsteed.

It appears from the whole of the observations, that, of all the stars, Arcturus is carried with the greatest celerity, by his own motion, westward; since the same attendant, which in Flamsteed's time, on the 14th of February, 1690, preceded Arcturus 5" in time, now enters the meridian 6" after him. From the diminished difference also, of declination between Arcturus and his attendant, it is evident, that Arcturus progresses annually, by his own appropriate motion, nearly 2" in a circular course, towards the south. From this it clearly results, that the declination of the attendant, as observed by me, reduced to the parallel of Greenwich, produces the same altitude of the Greenwich pole, as that deduced from Flamsteed's observation; but not so, the declination of Arcturus, observed at the present day, even with the aberration and nutation corrected.

A similar investigation may be made, with respect to the other fixed stars and their attendants; and, from the comparison already begun with other fixed stars, it may be ascertained whe-

ther an appropriate motion is to be attributed to the fixed star or its attendant, or to both.

All my observations are made in a meridional plane with a mural quadrant, at Manheim, in his Serene Highness the Elector Palatine's new Observatory, erected for me: its longitude, East from Greenwich, is nearly $34^{\circ} 6''$, in time; its latitude, nearly $49^{\circ} 27' 50''$.

It will give me very great pleasure, if I shall learn that these observations of mine do not prove unacceptable to your illustrious society: to whose goodness I most respectfully commend myself; being ever the very devoted admirer and humble servant of your illustrious and celebrated Society.

CHRISTIAN MAYER,
Astronomer to his Serene Highness the Elector
Palatine and Duke of Bavaria.

Manheim, in Germany, April 24, 1778.

*Letter from Mr. Rittenhouse to Professor Mayer of Manheim, in
Germany.*

Philadelphia, August 20th. 1779.

Sir,

I am directed by the Philosophical Society to acknowledge your letter of the 24th of April, 1778, and to return you their thanks for communicating the Observations it contains, wishing you success in further prosecuting so curious a Discovery. They likewise embrace this occasion to replace the volume of their Transactions which shared the fate of your more valuable papers.

This country having been the seat of war, our meetings have been interrupted for two years past, and the publication of a second volume thereby prevented; but as the Society is again revived, and we have materials for the purpose, it will not be much longer delayed.

You will please to accept, by this conveyance, a discourse delivered some years ago before the Philosophical Society, which I the rather present you with, because I, therein, gave my opinion that the fixed stars afforded the most spacious field for the industry of future Astronomers, and expressed my hopes that

the noblest mysteries would sometime be unfolded in those immensely distant regions.* Your excellent discovery has proved that passage to be well founded, and I shall be happy in hearing farther from you on this subject. It is unnecessary for me to suggest to you a comparison between the many Observations you have made, in order to determine whether the several changes observed will agree with any imagined motion of our system. Those you have communicated seem to favour such a supposition. I am, Sir, your most obedient and humble servant.

DAVID RITTENHOUSE, *Vice-President.*

Some Remarks of Mr. Rittenhouse, on the famous Problem of Archimedes.†

To the Printers of the Pennsylvania Gazette.

Philadelphia, Oct. 8th. 1767.

Gentlemen,

In your paper, No. 2017, an ingenious gentleman who signs himself T. T. has favoured the public with remarks upon that celebrated saying of the famous Syracusean geometrician: "Give me a place to stand on, and I will move the Earth." When these remarks appeared, I was engaged in matters that would not allow me to pay that attention to them, which they deserved. The justice, however, due to Archimedes, and the respect I bear for that truly great man's memory, oblige me now (though late) to offer my sentiments upon this interesting subject.

I readily agree with your sensible correspondent, as to the conclusion he has drawn from the principles whereon he seems to have founded his calculation, without being at the trouble to examine his numbers. All that I propose is, to place this grand mechanical problem in another light, wherein it will appear more feasible.

If a ball of earth, weighing 200 pounds, were left at liberty near the surface of this globe, it would descend, by its own gravity, about 15 feet in one second of time, and about 20 miles in 80 seconds: And if, as this gentleman supposes, there are about 2000 trillions of such balls in the whole Earth,—the Earth,

* See page 330 of the foregoing Memoirs.

† See page 154 of the foregoing Memoirs.

by their mutual attractions, in 80 seconds of time, will move toward the ball $\frac{1}{1753,000,000,004,000}$ of an inch; and if the same force were to act continually for 105 years, it would move about one inch. Therefore, the force wherewith a man acts, when he lifts a weight of 200 pounds, if applied without intermission for the space of 105 years, is sufficient, without any machinery, to move the Earth one inch in that time;* and it must, from the velocity received by that force alone, continue for ever after to move at the rate of one inch in about 50 years.

A. MECHANIC.

Letter from Mr. Rittenhouse, to the Rev. Mr. Barton.

Norriton, July 20th. 1768.

Dear Brother,

In Hall and Sellers' paper of last Thursday, we have some curious remarks on an Essay for finding the Longitude, lately published in the Pennsylvania Chronicle, and which I had before seen in the London papers.

The first remark is no doubt just, and is perhaps the only one made, which Mr. Wood's essay gave just occasion for; how he could commit such a mistake, is not easy to conceive. But the remarker immediately charges him with another: for he tells us, that he (Mr Wood I suppose) says, that Mr. Harrison's Machines were finished about Christmas 1765; whereas his father (whether Wood's father or Harrison's, is not clear,) made three, which the remarker saw in motion about 18 years since. He then proceeds to assure us, (by the spirit of prophecy I presume, at least I cannot conceive how he could come by this piece of knowledge in a natural way,) that neither the father or his son will ever be able to finish their machines.

A machine, says the remarker, to measure the mean motion, will be far preferable to any other method yet proposed; and immediately afterwards he confesses, he cannot conceive that a true meridian can be found at sea, to several minutes. Now this "uncertain error" must certainly affect any other machine for that purpose, as well as Wood's Sand-Glass, and exceed the error occasioned by turning the glass somewhat quicker at

* Mr. T. T. proceeding on a different supposition, has computed twenty-seven billions of years necessary for that purpose.

one time than another. Besides, it would not be easy to shew, why a machine to measure the Earth's mean motion on its axis, with respect to the Sun, will be preferable to one that will measure the Earth's true motion on its axis, with respect to the fixed Stars.

I would not be thought to recommend Wood's project. He himself takes notice of two disadvantages attending it, viz. the wearing of the orifice through which the sand passes, and the sand itself becoming polished in time, so as to run more freely; to which if we add, that perhaps it may be greatly affected by heat and cold, there seems to be but little probability of its usefulness. Nor do I see how it can even have the merit of being new: for the scheme itself, with all the remarker's objections that have any weight in them, must readily occur to every person that thinks at all on the subject. I shall only observe, that it appears doubtful to me, whether the remarker does not equally deserve the censure he so freely bestows on Mr. Woods—"His works are full of errors, and his writings of contradictions."

* * * * *

I remain your affectionate brother.

DAVID RITTENHOUSE.

Dr. Rittenhouse's Chronometer.

The construction of this Time-piece is thus described by Mr. Henry Voight, chief coiner in the Mint, heretofore an eminent clock and watch maker in Philadelphia; an artist of great ingenuity, and well known for the excellence of his workmanship. The description is given in Mr. Voight's own words.

"The Clock which Dr. Rittenhouse made use of in his Observatory was a construction of his own. It had but three wheels in its movement, of high numbers. Only one pinion, without a wheel, driven by the main wheel; whose axis goes through the front plate, that carried the dial-work; and this wheel* has a perpetual rochet.† The seconds are eccentric, as in the common clocks.

* "The main-wheel, which is fixed on the barrel on which the cat-gut runs." *Mr. Voight.*

† "A perpetual rochet is a spring lying between the main-wheel, and a plate which is so high in diameter as to be nearly of a height with the bottom of the main-wheel teeth, and is cut with

"The pallet-wheel moves outside of the back-plate, and the pallets are fastened to the rod of the pendulum, which has double suspending springs fixed in a cross-bar, to which the rod is rivetted in the middle. These springs are suspended as in common; but they are not so long as in general, and have only one-and-an-half inch free action, which keeps the pendulum very steady in its vibrations.

"On the rod of the pendulum there is fixed a glass tube, of the thickness of a strong thermometer-tube, and is in the whole as long as the rod: but it is bent, about one-third upwards; like a barometer, but longer; and upon that end, on the top, the tube is as wide again as it is below, for about one-and-an-half inch in length: the other two-thirds of the length is filled with spirits of wine; and at this end, the tube is hermetically sealed. The shorter part is filled with mercury, so high as to fill the widest part of it, about half an inch, and is not sealed but remains open. The bend is close together, and there is no more space between the tubes than three-eighths of an inch.

"This tube is fastened to the pendulum-rod with common sewing-thread, and rests upon two pins fixed in the bob of the pendulum, as high up as possible. The bob has no slide, but is immoveable; and the regulation of the pendulum is performed by adding to, or diminishing the mercury, in the part where the tube is widest."

fine teeth all round, in the shape of a fine saw. A click on an axis is fixed between the two frame-plates, with a weak spring that forces this click into the fine saw-teeth, which keeps the plate from moving backwards when the clock is winding up. This fine rochet-wheel is fixed on the barrel-arbour or axis, the same as the main-wheel. The barrel-rochet comes close against the plate of the fine rochet, which has a click screwed on the front, corresponding with the barrel-rochet, and a spring above that rochet's click, which forces that click into the barrel-rochet's teeth: it is this that makes the clattering noise, which is heard when a clock is winding up: There is a middling strong spring placed between two arms of the cross of the main wheel, bent like the space of the two arms between which it acts; and this spring is as broad as the thickness of the cross-arms. One end of that spring is fastened to the inside of the fine rochet-plate: the other end lies on the other cross-arm, and acts on that like a gun-lock mainspring on the cock tumbler. When the clock or time is set a going, and the maintaining power or weight of the fusee or barrel, this power will raise that spring so far as to resist the maintaining power, and becomes stationary as long as the time-piece is going; and when it is wound up, this spring in the main-wheel cross will expand itself, press on the cross-arm, and force that wheel forward, with nearly the same power as the maintaining power would give: the click for the fine-toothed rochet falls into one of those fine teeth, and keeps that rochet steady, without having the least motion, as long as the winding-up of the clock continues; and by this means a time-piece can lose no time in winding up: hence it is called a perpetual rochet; which requires the most accurate workmanship, in its construction." *Mr. Feight.*

In addition to the foregoing description of the mechanism of this Time-piece, obligingly furnished to the Writer of these Memoirs by Mr. Voight, he has been likewise favoured by Robert Patterson, Esq. director of the mint, with the following account of the same extremely accurate instrument, which will greatly assist the reader in understanding the principles on which it is constructed.

"In the Astronomical Clock made by Dr. Rittenhouse, and now in the Hall of the Philosophical Society, I do not know," says Mr. Patterson, "that there is any thing peculiar, which requires mentioning, except the pendulum; especially the apparatus for counteracting the effects of change of temperature.

"For this purpose, there is fastened on the pendulum-rod (which is of iron or steel) a glass tube of about thirty-six inches long; bent in the middle into two parallel branches, at the distance of about an inch from each other; the bend being placed downwards, immediately above the bob of the pendulum. The tube is open at one end, and close at the other: the arm which is close at top is filled, within about two inches of the lower end or bend, with alcohol, and the rest of the tube, within about one half of an inch of the upper extremity or open end, with mercury; a few inches of the tube, at this extremity, being about twice the width of the rest of the tube.

"Now, when the heat of the air encreases, it will expand the pendulum-rod; and would thus lower the centre of oscillation, and cause the clock to go slower: but this effect is completely counteracted, by the expansion of the alcohol chiefly, and of the mercury in part; which equally raises the centre of oscillation; and thus preserves an equable motion in all the variable temperatures of the atmosphere."

*Description of an Hygrometer; first contrived and used by Dr. Rittenhouse, about the year 1782.**

The essential part of this Hygrometer consists of two very thin strips of wood, about a foot long and half an inch broad,

* This description is drawn up from two separate accounts of the instrument, with which the Writer of these Memoirs was obligingly furnished, in writing, by Robert Patterson and the late David Rittenhouse Waters, Esquires, of Philadelphia. Mr. Patterson mentions, that he recollects his having seen the Hygrometer so described, in Dr. Rittenhouse's Observatory, about thirty years ago.

glued together, in such a manner that the grain or fibres of the one shall be at right angles with the other; so that when this compound strip was placed in erect position, the grain of one of the pieces of wood would have a vertical, and that of the other an horizontal position. One end of this simply constructed instrument is to be made fast to a wall, or plane board, with the edge outward; and the other end is to be at liberty to move.

Then, as moisture has little or no effect on the length of a piece of wood, or in the direction of its fibres, but a very sensible one on its breadth, or transverse direction, especially when thin, it follows, that on any increase of moisture in the air, this Hygrometer becomes bent into a curve, convex on the side of the transverse fibres; and *vice versâ*. The degrees, from the greatest dryness to the greatest moisture, are to be marked on a curve drawn on the board or wall, described by the motion of the free end of the Hygrometer; and an index, attached to the moving end of it, will point out, on this graduated arch, the existing state of the atmosphere at the moment, in relation to its condition of moisture or dryness: The relative degree of either, on the smallest change from the one to the other, will be indicated with much precision; and, probably, with much more uniformity and truth, in the results of long-continued observations, than can be attained to by the use of Hygrometers constructed of metal, or any other substance than wood.*

* The second volume of the Transactions of the American Philosophical Society contains a letter, written on the 13th of November, 1780, by Dr. Benjamin Franklin, then in France, to Mr. Nairne, of London: but it was not communicated to the Society, until January, 1786.

In that letter, Dr. Franklin suggests to Mr. Nairne (an eminent optician, and mathematical instrument maker,) the idea of an Hygrometer made of wood; in preference to metallic instruments, for the purpose of discovering "the different degrees of humidity in the air of different countries;"—an idea which occurred to the Doctor, in consequence of a casual circumstance, mentioned in his letter.

Dr. Franklin supposed "a quick sensibility of the instrument, to be rather a disadvantage" to it; "since," says he, "to draw the desired conclusions from it, a constant and frequent observation day and night, in each country—when the design is, to discover the different degrees of humidity in the air of different countries—will be necessary for a year or years, and the mean of each different set of observations is to be found and determined."—"For these reasons," continues the Doctor, "I apprehend that a substance which, though capable of being distended by moisture and contracted by dryness, is so slow in receiving and parting with its humidity that the frequent changes in the atmosphere affect it sensibly, and which therefore should, gradually, take nearly the medium of all those changes and preserve it constantly, would be the most proper substance, of which to make an Hygrometer:"—and he believes good mahogany wood to be that substance. In the concluding part of this letter, Dr. Franklin says to his correspondent: "I would beg leave to recommend to you—that you would take a number of pieces of the closest and finest grained mahogany that you can meet with; plane them to the thickness of about a line, and the width of about two inches across the grain, and fix each of the pieces in some instrument that you can contrive, which will permit them to contract and dilate, and will shew, in

Astronomical Observations, made in the years 1776, 1777 and 1778, at Philadelphia, by the Rev. Dr. W. Smith, and David Rittenhouse, John Lukens, and Owen Biddle, Esquires: copied from a manuscript account of those Observations, drawn up by Dr. Smith; never before published.

ASTRONOMICAL OBSERVATIONS, 1776.

This year exhibiting little else but scenes of confusion and distress amidst the calamities of an unhappy war, scarce any attention was paid, by the members of the American Philosophical Society, to astronomical or any other literary subjects. It was agreed, however, by Mr. Rittenhouse, Mr. Lukens and myself, to look out whether Mercury would touch the Sun's disc the 2d of November this year; as a very small difference of latitude from what the Tables give, would have carried the planet clear of the Sun: but, from our observation of the transit of this planet, in 1769, we had reason to expect it would pass further on the Sun, than Halley's Catalogue gives it.

The following were the observations made, viz.

Nov. 2d, 1776. I got ready the two f. reflector with the largest object-glass, and shortest eye-tube, magnifying about 95 times.

At 4^h per clock—No appearance of the planet on the Sun, and did not expect it until about half an hour past 4; but as Mr. Lukens and Mr. Rittenhouse had not yet come to me in the college, I sent to hasten them.

At 4^h 5' per clock—took my eye from the tube to adjust it, and fix the smoked glass, to give clearer vision, the atmosphere being hazy. Having fixed the smoked glass in the proper place, so as to prevent its sliding or falling with its own weight, and before I had applied my eye to the telescope again, Mr. Rittenhouse came in; and I desired him to see if the focus and dark glass were all suitable to his eye, as they were to mine. I had been about 4' employed in this adjustment.

sensible degrees, by a moveable hand upon a marked scale; the otherwise less sensible quantities of each constitution and duration."

Hence it appears, that Franklin and Rittenhouse conceived an idea of the same kind, nearly at the same time; but that the latter carried his invention into practice, three or four years before the theory of the former, founded on similar principles, had been announced to the American public, or, as it is believed, was made known to any other person than Mr. Saurin, W. B.

Per Meridian Mark.

^d			^h	^m	^s
3	☉	West Limb on Merid.	-	12	0 36
		East Limb on do.	-	12	2 52
<hr/>					
		Centre		12	1 44
		Correct Noon per Clock.			

Applied to Going of Clock.

Nov. 3d, at Noon			
Clock slower than ☉	4	5.6	} Daily gaining of the Clock over mean or equal time.
☉ faster than mean time	16	11	
Clock faster than m. time	12	5.4	

4th,			
Clock slower than ☉	2	53.2	} From 3d to 4th 1 10.4
☉ faster than mean time	16	9	
Clock faster than m. time	13	15.8	

7th			
Clock faster than ☉	0	31	} From 4th to 7th at a mean per day } 1 5.1
☉ faster than mean time	16	00	
Clock faster than m. time	16	31	

8th			
Clock faster than ☉	1	44	} From 7th to 8th 1 9
☉ faster than mean time	15	56	
Clock faster than m. time	17	40	

Thus the Clock gains at a mean, per day, 1' 8".

Whence, Nov. 2d, at noon, the Clock was 10' 57" faster than mean time, gaining 68" per day; and 4^h 17' gains 12", wherefore at the internal contact, the Clock was 11' 9" faster than mean time.

Whence the contact was at 4^h 5' 51" mean time; or 4^h 21' 2" apparent time.

Eclipse of the Sun, January 9th, 1777.

The Gregorian Reflector, with the magnifying power of 95, was made use of for this Observation; which, as well as the Ob-

servation of the Transit of Mercury, was made in the College-Library, to which the Telescope belongs.

While Mr. Rittenhouse was endeavouring to adjust the two-f. reflector belonging to the Library of the city of Philadelphia, made by Short, and which had been borrowed on this occasion, I observed with the greatest certainty the first contact of C's limb with the ☉, which was shining very bright, and the telescope in the best order, viz. at 8^h 57' 27" per clock.

The same was visible, in about 3" more, to Mr. Lukens, with the equal altitude instrument, magnifying about 25 times.

Mr. Rittenhouse had not got the other reflector ready to observe the beginning of the eclipse: but the end was observed by both of us to the same instant, viz. at 11^h 48' 50" per clock.

The clock, at noon, was 23" slower than mean time, whence

Beginning of the Eclipse	8 ^h 49' 55"	} Apparent time.
End of the same	11 41 15	

N. B. The clock stopped once during the Observation, owing, it was supposed, to the cold weather; but was oiled a little, and set a going again by a stop-watch that beats seconds, and which was set with the clock at the beginning of the eclipse: so that she lost no time. She was examined at noon, and found as above by the meridian mark. But this mark itself, having been lately shaken with the stormy weather, is to be re-examined, and also equal altitudes taken the following days.

The annexed micrometer measures were taken for determining the quantity of the eclipse, chiefly by Mr. Rittenhouse. More would have been taken, but the Sun was hid under clouds for about an hour after the middle of the eclipse, and broke out again a little before the end.

Micrometer Measures.

h	'	"	inches.	tenths.	hooths.	
9	15	0	2	2	6	} distances of the cusps.
	31	0	3	1	$\frac{1}{2}$	
10	17	5	1	1	14	} enlightened parts remaining.
	22	0	1	1	23	
11	37	0	1	7	6	} distances of the cusps.
	38	46	1	5	21	
	42	26	1	2	18	

Continuation of the Observations for adjusting the Clock.

Jan. 11th. ☉'s W. limb on Merid. }
 E. limb on do. }

Centre on do.

Whence clock faster than mean time 0 1' 46" per merid. mark.

Equal Altitudes.

20th.	h	'	"			
	9	37	20	59	49	} Mean noon per clock 12 18 34
		39	1	58	6	
		40	41	2	56 26	

21st.	W. limb on Merid.	12 20 3
	E. limb on do.	22 23
	Centre on do.	<hr/> 12 21 12.5

	Eq. Alt.	
22d.	9 14 10 3 31 10	Mean noon per clock 12 22 50

Eclipse of the Sun, June 24, 1778: Observed by D. Rittenhouse, John Lukens, Owen Biddle, and William Smith, at the College of Philadelphia.

The morning being very cloudy, the beginning of the eclipse was not seen.

At 10^h 7' 40" per clock, the following micrometer-measure of the enlightened parts was taken, while the Sun appeared for a few minutes between clouds, viz. 1st. 9-10^{ths}. 13-500^{ths}. = 16' 23".

11^h 6' 57" per clock, end of eclipse distinctly seen, the Sun having shone clearly for several minutes, the clouds now wholly dispersing, and the remainder of the day continuing clear.

Observations upon the Clock.

27th.	☉ on meridian per clock	h	'	"
	☉'s app. time of passing meridian	11	54	50
		12	2	33.5
	Clock slow of app. time	<hr/> 0	7	43.5
July 2d.	☉ on meridian per clock	11	54	50.5
	☉'s app. time of passing meridian	12	3	33
	Clock slow of app. time	<hr/> 0	8	42.5

* The calculations are here wanting, in Dr. Smith's MSS.

A versification of "The Zephyrs"—from Gesner's Idyls;—a fragment: copied from a loose scrap of paper, containing, in the hand-writing of the late Dr. Rüttenhouse, all but the three last verses; which have been now added, by a lady.

FIRST ZEPHYR.

Why, amidst these blooming roses,
Idly fluttering, dost thou stay?
Come with me to yonder valley,
There we'll spend the cheerful day.

There, in purest crystal fountain,
Sportive, bathe the am'rous maids;
Where tall willows, on the margin,
Form the closest deepest shades.

SECOND ZEPHYR.

No, with thee I will not wander;
To the vale alone repair:
Fan the nymphs you so admire;
A sweeter task employs my care.

Here, in the bosom of these roses,
I cool my wings in pearly dew,
As I lightly skim them over,
Gath'ring all their fragrance too.

FIRST ZEPHYR.

Your wings in dew of roses steep'd
With all their grateful fragrance stor'd;—
Can you find employment sweeter,
Than yonder cheerful nymphs afford?

SECOND ZEPHYR.

Yes, in this path, along the mount,
Each rosy morn a maid appears,
To yon lonely cot advancing,
A basket on her arm she bears.

Two tender infants, and their mother,
Are by her constant bounty fed :
A helpless widow, there residing,
From her receives her daily bread.

See ! where she comes,—of all the graces,
The youngest and the fairest too ;
Her cheeks, with sweetest blushes glowing,
Are moist'ned with the morning dew.

I haste, with fragrant airs, so cooling,
To fan her tender glowing cheek,—
And kiss the pearly drops, while falling
From her blue eyes, so chaste and meek.*

FIRST ZEPHYR.

Yes ! much more pleasing is your task ;
I would imbrue my wings in dew,
And bear the fragrance of these flow'rs,
Melinda to refresh, like you.

But see ! she breaks through yonder grove,
Refulgent as a summer's morn ;
Her step is grace—her lip of rose
The smiles of modest worth adorn.

Like you, transported, let me fan her ;
Like you, admire the bounteous maid :
For, sure, a fairer face I never
Spread forth my cooling wings to aid.

Diploma.

Præses et Professores Collegii, seu Universitatis, GULIELMI
ET MARIAE, omnibus at quos præsentēs literæ pervenerint,
Salutem.—Cum eum in finem gradus academici majoribus

* Here Dr. Rittenhouse's fragment ends : The remainder of the verification is continued by another hand.

nostris prudenter instituti fuerint, ut viri optimè meriti, seu in gremio nostræ matris educati, seu aliundi bonarum artium disciplinis eruditi, istis insignibus a literatorum vulgo secernerentur; sciatis, quod nos, ea sola quæ possumus viâ, gradu Artium Magistri libenter studiosèque concessio, testamur quanti facimus **DAVIDEM RITTENHOUSE** *Philosophorum Principem*, qui ingenio nativo *Machinam celeberrimam*, motus et phænomena cœlestium manifestius exhibentem, commentus est:—Idcirco, in solenni convocatione, tricesimo die decembris, Anno Domini millesimo septingentesimo octogesimo quarto, habito, *conspirantibus omnium suffragiis*, eundem virum egregium, **DAVIDEM RITTENHOUSE**, *Artium Magistrum* creavimus et constituimus.—In cuius rei testimonium, sigillum Universitatis, quo in hac parte utimur, præsentibus apponi fecimus. Datum in domo nostræ convocationis, anno domini, die et mense, prædictis.

J. MADISON, Præses, et prof. Ma. and Nat. Phil. G. WYTHE, Leg. et Polit. Prof. ROBERTUS ANDREWS, Math. Prof. CAROLUS BELLINI, Neot. Ling. Prof.

Diploma.

Præses et Curatores Collegii Neo-Cæsariensis, omnibus has Literas lecturis, plurimam Salutem.

Quandoquidem æquum sit et ratione prorsus, consentaneum, ut ii qui labore et studio bonas didicerunt artes præmia suis meritis digna referant ut et ipsis benè sit, et aliorum provoceter industria.

Quando etiam huc potissimum spectant amplissima illa jura nostro Collegio publico Diplomate collata. Quumque clarissimus vir **DAVID RITTENHOUSE** sit non tantum Moribus inculpatus et Ingenio insignis, sed et sibi tantam in Artibus liberalibus cognitionem Industria laudabili acquisivit, ut summos Honores Academicos probe mereatur.

Idcirco notum sit omnibus, quod nos, Senatus-consulto Academico nec non Facultatis Artium decreto, supradictum **DAVIDEM RITTENHOUSE** Titulo Graduque DOCTORIS IN LEGIBUS adornandum, et dehinc pro Adepto et Doctore habendum volu-

mus; ejus, hæc Membrana, Sigillo nostri Collegii rata et Chirographis nostris munita, Testimonio sit.

Datum Aulæ Nassovicæ, Pridie Calendas Octobris Anno MDCCLXXXIX.

JOANNES WITHERSPOON, Præses. Joannes Rodgers, Joannes Bayard, Joannes Woodhull, Guls. Paterson, Isaacus Snøwden, Jacobus Boyd, Joannes Beatty, Guliel. M. Tennent, Andreas Hunter, Curatores.

An English Obituary Notice of Dr. Rittenhouse : Extracted from the European Magazine, for July, 1796.

In the sixty-fourth year of his age, died DAVID RITTENHOUSE, The American Philosopher. His history is curious, from the admiration in which his character was held.

Rittenhouse was a native of America; and, in the early part of his life, he mingled the pursuits of science with the active employments of a farmer and watch-maker.* In 1769, he was invited by the American Philosophical Society to join a number of gentlemen who were then occupied in making some astronomical observations, when he particularly distinguished himself by the accuracy of his calculations and the comprehension of his mind. He afterwards constructed an observatory,† which he superintended in person, and which was the source of many important discoveries, as well as greatly tending to the diffusion of knowledge in the western world. During the American war, he was an active assertor of the cause of independence. Since the establishment of the peace, he successively filled the offices of Treasurer of the State of Pennsylvania

* He never professed the business of making watches: the first mechanical occupation he assumed was that of a clock-maker, an employment he pursued many years, in the earlier part of his life. W. B.

† Having, in the preceding note, adverted to the unimportant error in the text, wherein our Philosopher is stated to have pursued the employment of a watch-maker, instead of that of a clock-maker; it becomes necessary to notice, in this place, another mistake, though likewise an inconsiderable one, into which the liberal and candid writer of the article, above quoted, has been led. Dr. Rittenhouse's Observatory, at Norriton—the place of his original residence and the seat of his farm-house—was erected *prior* to the celebrated "Astronomical Observations" made by him, in the year 1769; which were those relating to the Transit of Venus over the Sun's disk, on the 3d of June in that year. W. B.

and Director of the National Mint; in both of which capacities, he was alike distinguished for strength of judgment and integrity of heart. He succeeded the illustrious Franklin in the office of President of the Philosophical Society; a situation which the bent of his mind and the course of his studies had rendered him eminently qualified to fill: and towards the close of his days, he retired from public life to the enjoyment of domestic happiness; when he formed a circle of private friends, who will continue to admire his Virtues as a Man, while the world will applaud his Talents as a Philosopher.

Letter from the Rev. Mr. Cathcart, to the Writer of these Memoirs.

York, 13th. Nov. 1812.

Dear Sir,

The following is a statement of the conversation which took place between Dra. Sproat and Rittenhouse, mentioned by me to Bishop White.

At a time when Dr. Rittenhouse was confined by sickness to his room, or perhaps to his bed,* he sent for the Rev. Dr. Sproat to visit him. The Doctor was somewhat surprised, on receiving the message: but as he had made it an uniform rule to visit all who sent for him, he expressed his surprise at being sent for; observing, that he could offer no comfort or consolation to any person, who was not a Believer in the Christian Religion. On hearing this declaration, Dr. Rittenhouse immediately asked, if Dr. Sproat considered him among the number of such? To which the Doctor answered; that the world had generally classed him with them. Dr. Rittenhouse on hearing this, with great mildness and a smile on his countenance, replied, that the opinion of the world was sometimes wrong; and, as it respected himself, he could with truth declare, that ever since he had examined Christianity and thought upon the subject, he was a firm believer in it; and, that he expected salvation *only* in the way and manner, as proposed in the Gospel.

* The time above referred to, is supposed to have been in the year 1790 or 1791; though perhaps it may have been somewhat earlier. Dr. Sproat died in the autumn of 1793. W. B.

The above is the *substance* of what Dr. Sprout mentioned to myself; and I might add, that when the good old man told it, his eyes overflowed with tears of joy. It gives me pleasure to be able to furnish you with this satisfactory proof of Dr. Rittenhouse's faith; and which I once introduced into a sermon preached in the city, as justice due to the character of the deceased, and who had been triumphantly claimed by the Infidels. I am happy to find that you are engaged in the laudable business of writing the Life of that worthy Man. Yours, respectfully,

ROBERT CATHCART.

WILLIAM BARTON, ESQUIRE.

CHARACTER OF DR. RITTENHOUSE :

Communicated to the Author of the Memoirs of his Life, in a letter from Andrew Ellicott, Esq.

Lancaster, December 30th. 1812.

Dear Sir,

I felt no small degree of pleasure and satisfaction, on understanding that you are about publishing Memoirs of the Life of Dr. Rittenhouse; knowing, from your connexion, and intimacy with him for many years, you have it in your power to delineate, and transmit his true character and a knowledge of his rare virtues to posterity, with as much, if not more accuracy than any other person. As I also have had the pleasure and advantage of Dr. Rittenhouse's acquaintance and friendship, I request you to accept of the following short sketch of his character, as a small testimony of my esteem for him when living, and of my veneration for his memory, now he is no more. I am, dear Sir, your sincere friend,

ANDREW ELLICOTT.

WILLIAM BARTON, Esq.

I became acquainted with the late Dr. Rittenhouse, in the sixteenth year of my age, being first introduced to him, after he removed to the city of Philadelphia, by the late Joseph Gallo-

way, Esq. and my Father ; both of whom were sincerely attached to him, not only on account of his scientific talents and acquirements, but for his public and private virtues. From that period, to the end of his life, we enjoyed an uninterrupted friendship.

In my scientific pursuits, I was frequently aided by him ; particularly, in that part which relates to Astronomy, with which he was better acquainted, both in theory and practice, than any other person in this country ; and when he ceased to calculate the Almanacks for the middle states, at his request I continued them several years.

In the years 1784 and 1785, Dr. Rittenhouse and myself were engaged in determining the boundaries between this commonwealth and the state of Virginia ; and in the year 1786, in determining the boundary between this commonwealth and the state of New-York. In those arduous employments, I had many opportunities of witnessing his address in overcoming the numerous difficulties we necessarily had to encounter, in the then wilderness, in which our operations were performed.

As a gentleman of general science, Dr. Rittenhouse would have held a respectable rank in any country ; but as a Mechanist and Astronomer, he has had but few equals. It has been frequently asked,—why he has not left more evidences of his talents, for the use of posterity ? In answer to this question, it is to be observed, that almost from his childhood, he had a complaint in his breast ; which increased so much with his age, that for the last fifteen years of his life,—and in which he had the most leisure for composition,—it was painful for him to support the position a person must occupy, when writing. This circumstance I have frequently heard him lament, in a feeling manner ; as it prevented him from answering letters with promptitude, and writing to his friends as often as he wished.

Though Dr. Rittenhouse had not the advantage of a liberal education, he wrote not only correctly but with ease : he made himself master of the German language, to which he was partial : and of the French, so far as to read the scientific works in that tongue, with facility.

As an Husband, and a Father, he might be taken as an example and a pattern, in the most virtuous community that ever existed. He was a good Citizen,—and warm and sincere in his

friendships ; and though reserved in large mixed companies, he was cheerful and communicative, when in a small circle of his friends. His mind appeared formed for contemplation, and therefore not calculated for the noisy and busy scenes of this world : from this placid turn of mind, he had a singular antipathy to all mobs and riots ; and I recollect to have heard him speak of the riots of the Paxton-boys, (as they were called,) with greater acrimony than on any other occasion,—more than twenty years after they happened. Being a philanthropist by nature, he wished the happiness and welfare of the whole human race ; and viewed slavery, in all its forms, with feelings of horror : from this attachment to the happiness, the rights, and the liberty of his fellow-creatures, he was led to take an active and useful part in favour of our revolution, which separated the colonies (now the United States,) from the mother-country.

His contemplative mind naturally carried him to piety ; but his liberality was so great, that he did not appear to give a very decided preference to any one of the sects into which Christianity is divided : he practised the morality of a sincere Christian, without troubling himself about the dogmas of the different churches.

His manners were plain and unassuming, though not without a sufficient share of dignity ; and, from a consciousness of his own talents, he did not envy those of others.

It has too frequently happened, for the honour of science and literature, that men of great and commanding talents, have been obstinately dogmatical, and impatient of contradiction ;—of those blemishes, Dr. Rittenhouse had not the least tincture.

To conclude,—if Dr. Rittenhouse was not the greatest man of the age, his character has fewer blemishes in it ; and, if his talents were not of that kind which are usually considered the most *brilliant*, they were—like those of WASHINGTON—of the most *solid* and *useful* order.

Some particulars concerning the Residence, the Tomb, &c. of Copernicus : communicated to the late Dr. Rittenhouse, Pres. A. P. S. by the Earl of Buchan.

"In the year 1777," says his Lordship, "my learned friend John Bernouilli, of Berlin, on one of his tours having happened to meet with the Bishop of Warmia,* in the Abbey of Oliva, near Dantzic, was informed by that prelate, that he had the pleasure to discover, in the Cathedral of Frauenburg, the Tomb of Copernicus, so long fruitlessly sought for.

"In the year 1778, Mr. Bernouilli having occasion to pass through Frauenburg, on his road to St. Petersburg, did not fail to visit the Cathedral, and explore the Monument of Copernicus. Acquainted with no one in the place, he was yet lucky enough to meet with a Canon, in the street, whose countenance invited him to accost him on this subject, and who proved very attentive to his researches. He informed him, that as for the Ashes of Copernicus, they were mingled in the charnel-house with the bones of the fraternity of the Canons; but that, for the Tombstone of the Philosopher, it was no more than a tablet of marble, simple, as the mode was of his days, and had no other inscription than these words—NIC. COPERNICUS, THOR:—That this tablet had remained hidden for some time, in rubbish; and when recovered, was placed in the chapter-house, till a more suitable place should be destined for it. Mr. Bernouilli expresses his regret to me, that he had not urged the Canon to indulge him with a sight of this Stone; and to look for a further inscription, to support the assertion of Gassendi, who mentions (page 325), That the Bishop Martin Cromer, an eminent Polish historian, caused a mural marble monument to be inscribed

* An uncle of Copernicus was Bishop of Warmia, (in Ermeland, a little province of Poland,) and gave him a canonry in his cathedral of Frauenberg, a city in dual Prussia, situated on the Frische Haß, at the mouth of the Vistula: it was there he began to devote himself to astronomy, at the age of twenty-eight years. His great work, *De Revolutionibus Orbium Coelestium*, was completed about the year 1530: but his apprehensions of meeting with persecution from the bigotted ignorance of the age, in consequence of the system he therein promulgated, deterred him from publishing it until thirteen years after that period; and it is supposed that the agitation of his mind, occasioned by its appearance in the world, produced the sudden effusion of blood, which terminated his life on the 24th day of May, in the year 1543. W. R.

and erected to the memory of Copernicus, with the following inscription :

D. O. M.
R. D. NICOLAO COPERNICO,
Torunensi, Artium et
Medicinæ Doctori,
Canonico Warmiensi,
Præsenti Astrologo, et
Ejus Disciplinæ
Instauratori;
MARTINUS CROMERUS,
Episcopus Warmiensis,
Honoris, et ad Posteritatem
Memoriæ, Causâ, posuit;
M. D. L. X. X. X. I.

"Gassendi adds, that this Monument was not erected until thirty-six years after the death of Copernicus, which does not agree with this date of 1581.

"The good Canon informed Bernouilli, that he was lodged in the apartment of Copernicus, of which he was very proud; and invited the Prusslan Philosopher to visit him in that place, which he accordingly did; and was shewn by the Canon another place, above the Dormitories, which had been used by Copernicus as his study and observatory, in which the Canon had a portrait of that eminent man, concerning the original of which he would not say. This little Observatory had an extensive view; but when Copernicus had occasion for one more extensive, he was wont to observe on the gallery of the steeple, which communicates with this place.

"Charmed with these classic footsteps, Bernouilli forgot to look at the Monument on the chapter-house, above mentioned. In a repository adjoining to the Cathedral, the Canon shewed Bernouilli the remains of a hydraulic machine said to have been invented and used by Copernicus. The construction seemed interesting, but in great disrepair; and Bernouilli had not leisure to examine it particularly. The use of the machine was to force and convey water into the most elevated apartments of the house of the Canons, who are now under the necessity of having it fetched from a distance, from the lower Town."

"I remember to have seen (says Bernouilli), in some old German Journal, that the Library of the ancient town of Konigsberg contained some books, chiefly mathematical, which were part of the Library of Copernicus; and also his Portrait, which had been purchased at Thorn, where the remains of his family still possessed the house in which he was born, as late as the year 1720. In P. Freher's *Theatrum Virorum eruditiorum*, there is a Chronostick on the year of Copernicus's death, 1543. p. 1447.

eX hoC eXCessIt trIstI CopernICV's eVo,
IngenIo astronVM et CognItIone potens.

"In the above mentioned book, p. 1442, there is a neat little Print of Copernicus. In Hartknoch's *Alter und neues Preussen*, there is a print of Copernicus, from a picture on wood which hangs in what they call his Cenotaph, at Thorn; and which represents him kneeling, in his canonicals, before a Crucifix;—and below this portrait are these *sapphic* verses:

Non parem Pauli gratiam requiro,
Veniam Petri neque posco; sed quam
In Crucis ligno dederas sationi,
Sedulus oro.

(a little lower)

Nicolao Copernico, Thoruniensi, absolutæ subtilitatis mathematico, ne tanti viri apud exteros celeb. in sua patria periret memoria, hoc monumentum positum.

Mort. Varmiaë, in suo Canonicatu, Anno 1543—
die 4 + ætatis LXXIII.

(lastly, lowest.)

Nicolaus Copernicus, Thoruniensis, Mathematicus celeberrimus.

"This Monument of Copernicus was erected by Melchijor Pynesius, M. D. who died in 1589.

"On the same altar-piece, or picture, is represented the portrait of John D'Albert, with the following inscription.

Illustris Princeps Dn. Joh. Albertus, Polo. Rex, apoplexiâ hic Thoru. mortuus, Anno 1501, die 17 Maii, ætat. 41; cujus viscera hic sepulta, Corpore Craco translato; Reg. Ann. VIII.

"Upon the whole," concludes Lord Buchan, "it appears the likeness I send, of *Copernicus*, is most to be depended on; and, as such, I flatter myself it will be an *Heir-loom to infant America!* Concerning Napier, it is needless for me to enlarge; the learned Dr. Minto having enabled me to do justice to his memory."

Although the following particulars respecting Dr. Rittenhouse were not communicated by the writer, Professor Barton, until it was too late to give them a place in the body of the work, the Author nevertheless is glad to have an opportunity of presenting to the public, even at the close of his book, the interesting circumstances this communication contains.

As Optics were one of his favourite studies, so he at one time contemplated a course of public, and I think popular, lectures on this beautiful and important branch of physics. On this subject he mentioned to me his intention in the winter of 1785-1786. The enthusiasm, indeed, with which he developed his design, and I may add the warmth of zeal with which his manner at the time inspired me, I can never forget. And, indeed, I cannot but regret, that our excellent friend never made his appearance in publick, as a LECTURER. As such, he would, unquestionably, have greatly advanced the love and the knowledge of natural philosophy in the United-States. He may, perhaps, have wanted some of the qualifications of a popular teacher. He would not have aspired to finished eloquence of style: to the eloquence of gesture and of manner, he was still more a stranger. But there is an eloquence of physiognomy, which Mr. Rittenhouse most eminently possessed. The modesty and amenity of his manner would have effected much, whether his audience had been a class of philosophers, or an assembly of ladies. Of his own discoveries, and opinions, and theories, he would have always spoken with that sweet and modest reserve, for which he was ever distinguished. He would have dwelt with the most generous and ample enthusiasm upon the great discoveries of Newton; and if, at any time, he could have forgotten that impartial conduct, which it is the duty of the historian of a science to observe, it would have been when he might

have had occasion to defend the theories of that great man, against the objections of succeeding and minor philosophers.

In Physics, Newton was his favourite author. Of him he ever spoke with a species of respect bordering upon veneration. He considered him as one of those few great leaders in science whose discoveries and services can never be forgotten: whose fame, instead of diminishing, is destined to be augmented, with the progress of time. I had many opportunities of being witness to the exalted opinion which he entertained of the immortal British philosopher. He read Dr. Bancroft's objections to some parts of Sir Isaac's theory of colours, with a firm conviction, that the Newtonian principles were still unshaken: and I well remember, that he once referred me to a paper which he had published, in one of our magazines, in answer to some objections which the late Dr. Witherspoon had urged against some of the theories of Newton.

It has been observed by a celebrated writer, that mathematicians in general read but little of each other's works. This remark, if I mistake not, is very strongly illustrated in Mr. Rittenhouse. However it may have been in his earlier age, I am confident that during the last thirteen years of his life, when my intercourse with him was great, and indeed but little interrupted; I am confident, that at this matured and auspicious era of his life, our friend was not a laborious student. He looked into many books, and he often passed quickly from one kind of reading to another: from philosophy to poetry; from poetry perhaps to philosophy again. His reading may be said to have been desultory. I have little doubt that this rather irregular manner of reading was, in some measure, the result of his extreme delicacy of constitution, which rendered a more unvaried application to any one kind of reading, irksome and oppressive. Often have I seen him lay down his book or pen, to recline upon his sofa, the circumscribed flush upon his cheeks plainly indicating the physical state of his feelings. A short repose would enable him to return to his studies again.

Mr. Rittenhouse's application to books, had, no doubt, been more regular and constant in the earlier part of his life; before I knew him well, or before I had accustomed myself to watch the progress of his mind. He was, certainly, profoundly acquainted with the Principia and other writings of Newton,

which he read partly in the original, and partly through the medium of translation. And although, within the period of my better acquaintance with him, his reading I have said, was not intense, he suffered no important discovery in philosophy to escape his notice. Although his own library was small, he had ample opportunities, through the medium of the valuable library belonging to the Philosophical Society, and other collections in Philadelphia, of observing the progress of his favourite studies in Europe. He took much interest in the discoveries of Mr. Herschel, whose papers he eagerly read as they arrived from Europe: and I well remember the time (in 1785) when he was engaged in reading Scheel's work on Fire, which had recently appeared, in an English dress. He then assured me, that some of this great Swedish philosopher's notions concerning the nature and the laws of heat, had long before suggested themselves to his mind.

The chemical discoveries of Crawford and Priestley solicited some of Mr. Rittenhouse's attention, about the year 1785-1786, and for some time after. The brilliant discoveries of Priestley, in particular, were not unknown to him. Upon the arrival of this illustrious philosopher in Philadelphia, in 1794, Mr. Rittenhouse stood foremost among the members of the Philosophical Society in publicly welcoming the exiled philosopher to the country which he had chosen as the asylum of his declining years; and in expressing his high sense of his estimable character, and of the vast accessions which he had brought to science. I often met Dr. Priestley at the house of our friend. Their regard for each other was mutual. It is to be regretted that their immediate intercourse with each other could not be more frequent. Priestley had unfortunately chosen the wilderness, instead of the capital or its vicinity, as his place of residence: and Rittenhouse, alas! did not live two years after the arrival of Priestley in America.

On the death of Mr. Rittenhouse, Dr. Priestley wrote me a letter of condolence on the great loss which the publick had sustained; on the irreparable loss which I, in particular, had suffered. When the Doctor afterwards returned from Northumberland to Philadelphia, he discovered much solicitude to know from me Mr. Rittenhouse's religious sentiments, and the manner and circumstances of his death; and he evinced no small sa-

tisfaction in receiving from me that relation which I have already given you, of the last hours, and of the last words, of one of the best of men.

Mr. Rittenhouse had not studied natural history as a science : but to some of the branches of this science he had paid particular attention ; and upon some of them he was capable of conversing with the ablest, and the most experienced. In Botany, he was not acquainted with the scientific or classical names : but the habits, and in many instances, the properties of plants were known to him. I well recollect how great were his pleasure and satisfaction, in contemplating the *Flora* of the rich hills of Weeling, and other branches of the Ohio, when I accompanied him into those parts of our union, in the year 1785. In this wilderness, he first fostered my love and zeal for natural history. Upon his return from the woods, in the month of October, he brought with him, as ornaments to his garden, many of the transmontain plants of the state of Pennsylvania : and long before I knew that it grew wild in the vicinity of Philadelphia, upon the banks of his native Schuylkill, he had naturalized in his garden, the beautiful *Silene virginica*, which he designated with the name of "Weeling Star."

It is a fact, that in the last months of his life he devoted a good deal of his time to an examination of the structure of the most important organs of plants. Acquainted with that doctrine which forms the basis of the sexual system, he was fond of examining plants during the period of their inflorescence : and I remember, with what apparent pleasure, he pointed out to me the tube in the styles of some of the plants which grew in his garden.

He had made many observations upon the buds of trees, some of which I think were new. I regret that the memorandums which he kept of these observations have not been found among his papers.

Not fifteen days before his death, he had finished the perusal of a German translation of Rousseau's beautiful letters on Botany, which I had put into his hands.

Mr. Rittenhouse, like Newton and many other men of great talents, employed much of his time in the perusal of works on the subject of natural and revealed religion. This was, I think, more especially the case in the latter part of his life. Among

other books which I could mention, I well recollect that he read the *Thoughts* of the celebrated French philosopher Pascal: and he acknowledged, that he read them with pleasure. But that pleasure, he observed to me, was diminished, when he learned, what was often the state of Pascal's mind:—a state of melancholy and gloom: and sometimes even of mental derangement. At the time of his death, the American Philosopher was engaged in the perusal of Mosheim's Ecclesiastical History: and he had just before finished the perusal of the *Meditations* of the Emperor Marcus Antoninus; that excellent work, replete with the sublimest morality, and with much of a sublime religion.

About three weeks before his death, I had put into his hands the first volume of Dr. Ferguson's *Elements of Moral and Political Science*. I took the liberty of particularly directing his attention to the last chapter of the volume: the chapter on the future state. He read it with so much satisfaction, that he afterwards sent it to his elder daughter, with a request that she would peruse it.

The benevolent dispositions of our friend were well known to you. You have, doubtless, done justice to this portion of his character; yet permit me to mention a few detached facts, which have come under my own immediate notice, and the relation of which may serve to augment even *your* respect and veneration for Mr. Rittenhouse.

The year 1793 is memorable in the history of Philadelphia. During the prevalence of the yellow fever, in the summer of that year, Mr. Rittenhouse wrote to me a note requesting me to visit a number of poor people, in his vicinity, labouring under the malignant fever; and making it a condition of my attendance upon them, that I should charge *him* for my services.

In the month of March of the same year, I had a good deal of conversation with Mr. Rittenhouse, on the subject of penal laws. He did not think that the late judge Bradford, whose essay on this subject he greatly admired, and recommended to my perusal, was too lenient in his views of the subject. He observed, that although he had often served on juries, he thanked God, that he never had in any case where life and death were immediately involved; observing, that his conscience would *ever* reproach

him, if he had, in any instance, given his verdict for death. "Of all murders (he added) *legal* murders are the most horrid." He did not think that death ought to be the punishment for any crime.

The union of sensibility with benevolence is frequently observed. The sensibility of Rittenhouse was exquisitely nice; perhaps, I might say, it was somewhat morbid. In a conversation which I had with him on the subject of the analogies between animals and vegetables, when I had observed to him, that the further we push our inquiries into this interesting subject, the more reason we have for supposing, that those two series of living beings constitute, as many eminent naturalists have supposed, but one vast family, he said it appeared so to him, but he hoped it would never be discovered that vegetables are endowed with sensibility. "There is, he observed, already too much of this in the world."

His religion was sublime and pure. It had no tincture of superstition or credulity. Accustomed, from an early period of his life, to contemplate the largest and the smallest objects of Creation; and with respect to the former to view their arrangement and harmony in the construction of a system of immeasurable extent; in these objects and in these places, he beheld one of the revelations of our Creator. He could not be insensible of the ills, infirmities, and miseries of human life, and even of the life of inferior animals. But still he discovered, as he often observed to me, the existence and even the dominion of much benevolence through the world. He was wont to consider our benevolent dispositions, and our virtuous affections, as among the strongest proofs of the existence of a Creator. These dispositions, these affections, and our intellectual powers, are the genuine emanations of a God.

BENJAMIN SMITH BARTON.

Philadelphia, December, 1813.

Letter from Lady Juliana Penn to the Rev. Peter Miller, Ephrata.

Sept. 29th. 1774.

Sir,

Your very respectable character would make me ashamed to address you with words merely of form. I hope therefore you will not suspect me of using any such, when I assure you I received the favour of your letter with very great pleasure. And permit me, sir, to join the thanks I owe to those worthy women, the holy sisters at Ephrata, with those I now present to you, for the good opinion you, and they, are pleased to have of me. I claim only that of respecting merit, where I find it; and of wishing an increase in the world, of that piety to the Almighty, and peace to our fellow-creatures, that I am convinced is in your hearts: and, therefore, do me the justice to believe, you have my wishes of prosperity here, and happiness hereafter.

I did not receive the precious stone, you were so good to send me, till yesterday. I am most extremely obliged to you for it. It deserves to be particularly distinguished on its own, as well as the giver's account. I shall keep it with a grateful remembrance of my obligations to you.

Mr. Penn, as well as myself, were much obliged to you for remarking to us, that the paper you wrote on, was the manufacture of Ephrata: It had, on that account, great merit to us; and he has desired our friend, Mr. Barton, to send him some specimens of the occupation of some of your society. He bids me say, that he rejoices to hear of your and their welfare.

It is I that should beg pardon for interrupting your quiet, and profitable moments, by an intercourse so little beneficial as mine; but trust your benevolence will indulge this satisfaction to one who wishes to assure you, sir, that she is, with sincere regard, your obliged and faithful well-wisher,

JULIANA PENN.

MR. PETER MILLER, President of the Cloister at Ephrata.

*To the Memory of the Honourable Thomas Penn, Esq. who died
March 21. 1775.*

Peace, worthy shade! Peace to thy virtuous soul;
Life's contest past, thou now hast gain'd the goal,
Destin'd for honest innate truth, like thine,
Where moral goodness rises to divine.

True to thy friendship, sacred to each trust,
In every duty most exactly just:

A princely wealth fill'd not thy heart with pride,
Thou nobly cast the glitt'ring bait aside;
Made it subservient to some useful aim,
Some gen'rous purpose, or some proper claim:
As bounteous streams in pleasing currents glide,
It roll'd, refreshing, like some charming tide;
Cheer'd the lone widow in her humble dome,
And scatter'd comfort o'er her lonely home.
Thy guardian angel snatch'd thee from below,
E'er Pennsylvania was consign'd to woe:
Thou now may'st view, without one kindred tear,
What we deem harsh, oppressive and severe;—
Life's motley picture, at one view, may'st scan,—
Unwind its tangled, complicated plan,—
Where this great truth is clearly understood,
That "partial evil's universal good."

In broken parts, man the dark system spies,
While all lies open to celestial eyes;
The links, united, of our scatter'd chain,
Shew why PENN suffer'd tedious years of pain,—
Shew why one patient virtuous mind doth mourn,
And why sweet Peace is from a people torn.
For, individuals of earth's humble vale
Mount, in gradation, on a heav'nly scale:
Yet *Virtue*, only, has a charm in death;
Wealth droops his plumes, as man resigns his breath;
Its social merits can't ascend the skies,
Terrestrial substance can't to heav'n arise;
Too gross to enter the abodes divine,
In earthly darkness it can only shine.

Letter from General Washington to the Writer of these Memoirs.

Mount Vernon, Sep. 7th. 1788.

Sir,

At the same time I announce to you the receipt of your obliging letter of the 28th of last month, which covered an ingenious essay on Heraldry, I have to acknowledge my obligations for the sentiments your partiality has been indulgent enough to form of me, and my thanks for the terms in which your urbanity has been pleased to express them.

Imperfectly acquainted with the subject, as I profess myself to be; and persuaded of your skill, as I am; it is far from my design to intimate an opinion, that Heraldry, Coat-Armour, &c. might not be rendered conducive to public and private uses, with us,—or, that they can have any tendency *unfriendly to the purest spirit of Republicanism*: on the contrary, a different conclusion is deducible from the practice of Congress and the States; all of which have established some kind of *Armorial Devices*, to authenticate their official instruments. But, sir, you must be sensible, that political sentiments are very various among the people in the several states; and that a formidable opposition to what appears to be the prevailing sense of the Union, is but just declining into peaceable acquiescence. While, therefore, the minds of a certain portion of the community (possibly from turbulent or sinister views) are, or affect to be, haunted with the very *spectre of innovation*;—while they are indefatigably striving to make the credulity of the less-informed part of the citizens subservient to their schemes, in believing that the proposed General Government is pregnant with the seeds of Discrimination, Oligarchy and Despotism;—while they are clamorously endeavouring to propagate an idea, that those whom they wish, invidiously, to designate by the name of the “well-born,” are meditating in the first instance to distinguish themselves from their compatriots, and to wrest the dearest privileges from the bulk of the people; and while the apprehensions of *some*, who have demonstrated themselves the sincere, but too jealous, friends of Liberty, are feelingly alive to the effects of the actual Revolution and too much inclined to coincide with the prejudices above described,—it might not perhaps be advisable to stir any question that would tend to reanimate the dying embers of faction, or blow the dor-

mant spark of jealousy into an inextinguishable flame. I need not say, that the deplorable consequences would be the same, allowing there should be no real foundation for jealousy (in the judgment of sober reason,) as if there were demonstrable, even palpable, causes for it.

I make these observations with the greater freedom, because I have once been a witness to what I conceived to have been a most unreasonable prejudice, against an innocent institution: I mean, the Society of the Cincinnati. I was conscious that my own proceedings on that subject were immaculate. I was also convinced, that the members,—actuated by motives of sensibility, charity and patriotism,—were doing a laudable thing, in erecting that memorial of their common services, sufferings and friendships;—and I had not the most remote suspicion, that our conduct therein would have been unprofitable, or displeasing to our countrymen. Yet have we been virulently traduced, as to our designs: and I have not even escaped being represented as shortsighted, in not foreseeing the consequences,—or wanting in patriotism, for not discouraging an establishment, calculated to create distinctions in society and subvert the principles of a republican government. Indeed, the *phantom* seems now to be pretty well laid; except on certain occasions,—when it is conjured up, by designing men, to work their own purposes upon terrified imaginations:—You will recollect there have not been wanting, in the late political discussions, those who were hardy enough to assert, that the proposed General Government was the wicked and traitorous fabrication of the Cincinnati!

At this moment of general agitation and earnest solicitude, I should not be surprised to hear a violent outcry raised, by those who are hostile to the New Constitution, that the proposition contained in your paper had verified their suspicions, and proved the design of establishing unjustifiable discriminations. Did I believe that to be the case, I should not hesitate to give it my hearty disapprobation. But I proceed on other grounds:—Although I make not the clamour of credulous, disappointed, or unreasonable men, the criterion of Truth; yet, I think, their clamour might have an ungracious influence at the present critical juncture: and, in my judgment, some respect should not only be paid to prevalent opinions,—but even some sacrifices might innocently be made to well meant prejudices, in a popu-

lar government. Nor could we hope the evil impression would be sufficiently removed, should your Account, and Illustrations, be found adequate to produce conviction on candid and unprejudiced minds.

For myself, I can readily acquit you of having any design of facilitating the setting up an "Order of Nobility:"—I do not doubt the rectitude of your intentions. But, under the existing circumstances, I would willingly decline the honour you have intended me, by your polite INSCRIPTION; if there should be any danger of giving serious pretext (however ill-founded in reality) for producing or confirming jealousy and dissention, in a single instance; when harmony and accommodation are most essentially requisite to our public prosperity,—perhaps, to our national existence.

My remarks, you will please to observe, go only to the expediency, not to the merits of the proposition: what may be necessary and proper hereafter, I hold myself incompetent to decide; as I am but a private citizen. You may, however, rest satisfied, that your composition is calculated to give favourable impressions of the science, candour and ingenuity, with which you have handled the subject; and that, in all personal considerations, I remain with great esteem, Sir, your most obedient and most humble servant,

G^o. WASHINGTON.

WM. BARTON, Esq.

Dr. Benjamin Rush.

The foregoing Memoirs were entirely completed and prepared for the press, before the decease of this Professor occurred; as is mentioned in the preface.

Benjamin Rush was born in the county of Philadelphia, on the twenty-fourth day of December, 1745, O. S. Having graduated in the Arts at Princeton College, in the autumn of the year 1760, and afterwards studied medicine under the direction of the late John Redman, M. D. of Philadelphia, he completed his medical education at the University of Edinburgh; where he received the degree of Doctor in Medicine, in the spring of 1768. Returning to Philadelphia in the summer of 1769, he was, on the

31st of July, in that year, appointed Professor of Chemistry, in the College of Philadelphia; that chair having been supplied for some time before, by the late John Morgan, M. D. F. R. S. &c. About twenty years after this appointment (viz. in 1789), he succeeded Dr. Morgan in the Professorship of the Theory and Practice of Physic, in the same College: and in the year 1791, on the union of that College with the University of Pennsylvania, he was chosen Professor of the Institutes and Practice of Physick, &c. in the conjoint institution.

At divers times, and on various occasions, his talents were employed in affairs of political concern. Besides having held, at different periods, several other public stations, he was appointed a member of Congress for Pennsylvania, on the 30th of July, 1776: when he, together with some of his colleagues, appointed at the same time, subscribed the Declaration of American Independence; which great national act had received the sanction of congress, and been generally signed by the members, sixteen days before.

He died of a typhus fever, in Philadelphia, on the 19th day of April, 1813; being then advanced a few months beyond the sixty-seventh year of his age.

At the time of his decease, Dr. Rush was Professor of the Institutes of Medicine, of the Theory and Practice of Physic, and of Clinical Medicine, in the University of Pennsylvania: to which chair, vacated by his death, Dr. Benjamin Smith Barton, Professor of Materia Medica, Natural History and Botany, in the same institution, was elected in the month of July, 1813.

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